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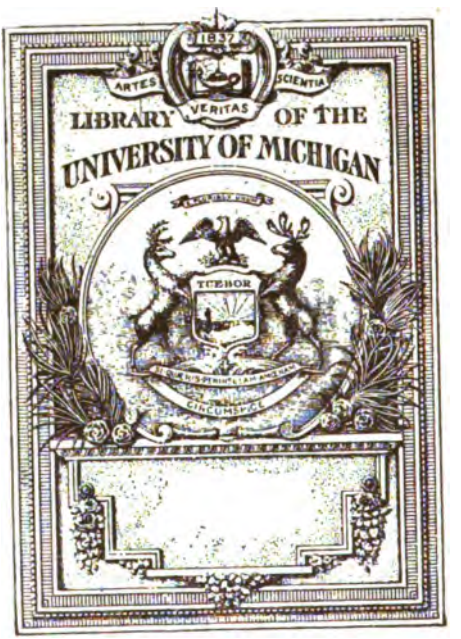
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AN ANTIDOTE FOR TIRED NERVES

TRAIL CRAFT

AN AID IN GETTING THE GREATEST GOOD OUT OF VACATION TRIPS

By
CLAUDE P. FORDYCE

Associate editor of *Outdoor Life;* Author of "Touring Afoot; Member of the Sierra Club, the Masama Club, the Colorado Mountain Club, the Mountaineers, etc.

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TO

STEWART EDWARD WHITE

Who knows the ways of wilderness trails.

FOREWORD

OCCASION is here taken to express appreciation for the co-operation of the following gentlemen who, as editors, have permitted the reprinting of my articles which have appeared in their respective magazines: Mr. Hy. S. Watson, of *Field and Stream;* Mr. Albert Britt, of *Outing;* Mr. Dan. B. Starkey, of *Outers-Recreation;* and Mr. J. A. McGuire, of *Outdoor Life.*

CLAUDE P. FORDYCE.

Falls City, Nebraska,
October 6, 1921.

INTRODUCTION

DEAR DOCTOR FORDYCE:

I am glad you are publishing the book. All your articles on the out-of-doors life have seemed to me practical, sensible, and the product of much experience, plus some discriminative thought. In book form they ought to be a great help, as well as an inspiration to go out and see if it works. That, in the last analysis, is the main thing;—to get 'em out. If, in addition, you can give them hints that will, through their interest or comfort, keep 'em out, the job is complete.

Sincerely,

STEWART EDWARD WHITE.

May 10, 1921.

CONTENTS

Chapter		Page
I.	Wilderness Handicraft	11
II.	Outfitting for Go-Light Trips	14
III.	Motor Camping	27
IV	Practical Mountaineering	38
V.	Hints on Desert Travel. Part 1	44
VI.	Hints on Desert Travel. Part 2	55
VII.	The Camp Cuisine	66
VIII.	Using the Reflecting Baker	74
IX.	Tents and How to Use Them	83
X.	Tent Making at Home	100
XI.	Tips on Teepees	104
XII.	Utilizing Balloon Silk in Camp	111
XIII.	Making the Recreation Cabin	121
XIV.	Taking the Place of the Do.tor	132
XV.	Uses of Adhesive Plaster in Camp	148
XVI.	Pests of the Wilderness	160
XVII.	The Indispensable Parka	169
XVIII.	Game Hunting with a Camera	174
XIX.	Photographic Developing in Camp	183
XX.	Leather Working for the Outdoor Man	193

ILLUSTRATIONS AND DIAGRAMS

	Facing Page
An Antidote for Tired Nerves	*Frontispiece*
The Art of Knapsacking	14
Equipment for Hike Trips	15
Movable Motor Camps	28
Motor Camping	29
Blazing Wilderness Trails	44
Mountain Climbing	45
Motoring in Death Valley	50
Teepees	51
Stuck in the Mud	60
Defeating the Arch Enemies of the Motorist—Sand and Mud	61
Cooking in Camp	66
Camp Stoves	67
Baking in Camp	76
Types of Tents	84, 85
Tarpaulin Tent	102
Tents You Can Make at Home	104
Making the Teepee	105
Homemade Necessaries for the Camper	114
Hiker's Tent and Pack Sack	118
Making the Recreation Cabin	122

ILLUSTRATIONS AND DIAGRAMS

CABINS - - - - - - - - - - - 126

CHALETS AT TWO MEDICINE CAMP, GLACIER NATIONAL PARK - - - - - - - 127

CONSTRUCTING A FIREPLACE - - - - - 130

FIRST AID ON THE TRAIL - - - - - - 148

USES OF ADHESIVE PLASTER IN CAMP - - 149

GAME HUNTING WITH A CAMERA - - - - 176

TROPHIES OF THE HUNT - - - - - - 190

MOCCASIN MAKING - - - - - - - - 200

TRAIL CRAFT

CHAPTER I

Wilderness Handicraft

THE enjoyment of a vacation really begins with the first preparation in which the participant makes free use of his own skill and ingenuity. The long winter evenings inspire the dyed-in-the-wool recreationalist to reminiscences of the past and to a delightful anticipation in formulating plans for the next season's joy. As spring opens, the *Wanderlust* permeates his whole being at the accidental mention of a name which savors of the wilderness, or mayhap by running across some item of duffle which brings out the old outfit, and from then on delightful hours are spent in rehauling in preparation for use. Never a season has been spent without alteration—some pet foible dropped from the list of supposedly necessary items and some new wrinkle substituted which boils the equipment down to that irreducible minimum which the touchstone of experience has taught is irrevocable.

Wilderness handicraft defines one's ingenuity displayed in making with his own hands devices which render the vacation less irksome, and this skill, pertaining as it does to the primitive pathways of the outdoors, is worthy of the specific term—Trail Craft.

Usage, never convention, is the only truthful dictator as to what is essential for the greatest utility. The selection of an outfit is a matter of individual temperament based on experience. What one calls a necessity, another calls a luxury, yet this same luxury, if one wants it bad enough, forthwith becomes a necessity. The fewer the items in your kit, the more must you have knowledge of how to live comfortably outdoors and how to employ the artifices of the camping art and how to utilize Nature's primitive stores.

You may elect to hit the trail "De Luxe" with an expensive and elaborate outfit carried by motor, which opens up a vast travel range and which permits the indulgence of various artifices of a luxurious civilization. Or you may be a true disciple of the Red Gods, going light, throwing off the fetters of restraint, emancipating yourself from the world of subterfuge and becoming a worthy dweller in the land where Nature has been undefiled by the desecrating hand of man. This Nomadage is the ideal way if you want to "do" the trick of getting close to Nature properly. You can pitch your camp wherever night overtakes you—today near the tranquil lake which stretches away to the distant hills that lead up to snow-fields and cloud-enshrouded pinnacles; tomorrow establishing the little bivouac in a clearing encircled on all sides by the unbroken chain of silent pine forest.

Following the trail is a delightful pastime. It demands simply a personal resolution to conquer and an adjustment of affairs to consummate. Its rewards are manifold. It is a primitive pathway whose following

brings one to the inner secrets of the wilderness habitants and the naïve beauties of their sanctuaries; it satisfies the body and soul by demanding simple, hearty living; it promotes honest companionship born of co-operation in enduring hardship, and creates a spirit ever responsive to the Red God's Summons.

CHAPTER II

Outfitting for Go-Light Trips

UNLESS he is gifted with a sustained enthusiasm for this sort of thing, the average individual never seriously entertains the thought of taking a hiking trip with bed, shelter, and food carried on his back. No—it means work, and he disdains to "scab" on pack horses. As a matter of fact, knapsacking means no privation at all if one is properly equipped. This avocation of being pedestrian-amateur-explorer is the best way of satisfying those mysterious primordial impulses that guide men to a soul-satisfying communion with Nature, and the work supplies just that physical exertion needed for rejuvenation—a physical re-creation which most every one, and particularly the sedentarian, needs. There is much to be said in favor of this type of outing. It turns you into an explorer, thereby developing your initiative. You enjoy absolute independence from the conventional outing as regards locale and mode of living. Being entirely upon one's resources, it is the ultimate test of one's ability in woodcraft and certainly is a key to one's gaminess.

A check list of one's summer-hike needs is the only safe guarantee of hitting the trail with a complete equipage, and no more joyful hours can be spent than the winter overhauling of one's kit anticipatory of the summer's realization. While this cataloging is of unquestioned utility, yet it is apt to overawe the tyro

THE ART OF KNAPSACKING

1. and 2. The Duluth Pack Sack, with the head strap and center suspension shoulder straps, is best.
3. The hunting unit for the knapsacker requires a small gun, with collapsible stock, its ammunition, a cleaner, and gun grease.
4. The silk shelter tent is weather-proof and yet gives the acme of comfort.
5. The chief enjoyment of hike trips is the independence they afford.

EQUIPMENT FOR HIKE TRIPS

1. Outdoor men agree upon certain indispensables which go into the pockets—a compass, match-safe, goggles, first-aid kit, knife, mosquito dope, and an emergency ration.

2. The mess kit must be light in weight and compact, a small sharp axe is essential, and for lights a candle may suffice or a folding lantern.

into the belief that so much stuff is to be taken that back packing it and enjoying the trip at the same time is an utter impossibility. Many items occupy but small compass and are of negligible weight, and the science of going light is to get the essential units, such as bed, shelter, clothing, mess kit, provisions, and first-aid kit, boiled down to an irreducible minimum. The outfit may contain also certain optional units from which your choice will be according to the particular needs depending upon your temperament, the kind of country to be traversed, whether scenic, game, or fishing; hence we may well include for your choice complete data for kits for photography, hunting, and fishing.

So important is it to be equipped rightly, that it is well to be specific in recommendation of those items which are deemed best for use as integral parts of an outfit which has passed the "acid test". Recommendations of equipment by hikers differ because there is no set standard, and hence are referable chiefly to individual preferences.

Knapsacking is a comparatively new game and it has been favored with but little published data. With this detached information the enthusiast has available but little organized method, and that is usually acquired by actual test. "In almost every art experience is worth more than precepts" (Quintillian).

The following notes on equipment are gleaned from tryouts of commonly used items with a view toward their particular adaptability in making the ideal knapsacker's camp, where portability must be ultimate and utility paramount.

The foundation of go-light camping is the shelter,

for two reasons—First, your trip will be a failure unless you are comfortable—you must sleep well and be protected from the weather and insect pests; secondly, the tent and sleeping equipment represent the bulkiest and heaviest items in the pack and must be reduced to a weight consistent with back packing, without sacrificing the utility for which they were intended.

Sleeping warm demands insulation by preventing the dissemination of heat waves, and, practically applied, I have found the best bed to be patterned after the suggestion made by Stewart Edward White. He recommends a wool felt pad, one inch thick and wide enough and long enough to accommodate the shoulder blades and hip bones. His blanket is of loosely-woven wool scarf material. But wool felt is hard to get. One may buy a wool batt at a department store, cover it with brown muslin and use it to make a thick shoulder and hip pad as light as the felt. An army blanket makes a good cover, but you should carry in it some cotton as well as wool. The preference of members of the mountaineering clubs is a wool-batt quilt covered with brown denim or muslin. Since many trips are taken where browse is hard to get we prefer the wool pad underneath in place of the browse bag as suggested by some outdoorsmen. The bag is the thing, however, where there is dependable supply of hay, grass, straw, or leaves for filling. Some like an air pillow, but a small muslin bag into which you put odd, soft, duffle items serves as a pillow very well. One kind, which proved popular with a mountaineering crowd in Glacier Park, was my knit helmet similar to that which the soldiers

used. It comes down over the neck and has an opening for the face. Using it as a sleeping cap it defies drafts and colds.

The desirable bed is in the shape of a sleeping bag with a cover which can be opened for airing and drying. It must be of balloon silk with waterproofing on the bottom only. My first sleeping bag was too small and I collated all the evil things men had said about sleeping bags and heartily wished for a companion to aid me in getting into the thing by the assistance of a shoehorn. And once in I couldn't bend my knees, and when I rolled over, the bag and bedding went with me. A roomy bag obviated the difficulties.

Doubtless the most indispensable item in making up light-weight camp equipment is balloon silk. It has revolutionized tent making and allows of the greatest freedom in a display of ingenuity. It goes into the make-up of such items as food bags, camera cover, water bucket, etc. The latter is particularly appreciated by the hiker. It is simply a transformed 9x10-inch food bag with a wooden embroidery hoop sewed into the top and a tape carrying handle attached thereto.

My favorite pack sack is the Duluth or Poirier style, whose pattern was somewhat modified by attaching an axe hanger on the back under the flap and extending the open top of the bag a foot or so with a puckering string at the edge. The bag, too, is made of balloon silk reinforced with tapes.

I have tried every tent or shelter that I know of being recommended for knapsacking. My preference is the sportsman's compac. It packs lightly (3½ pounds)

and is sufficiently roomy to accommodate two men. It is simply and quickly set up by staking out the four corner pegs under a tree and is suspended by throwing the peakrope over a projecting limb, or on mountaineering trips over two crossed alpenstocks. The peak is low, but the tent is well braced against storms and is particularly adapted to open country. A very desirable feature is the protection it affords. The floor is sewed in, making the roof, sides, and bottom all in one piece, thus it is snake-, bug-, and wind-proof. Little windows or ventilators allow of proper ventilation of air when the tent is buttoned up. No one shelter can be said to be so adapted to use in all kinds of camping as to be called the best all-round tent; but for the temporary mobile camp of the hiker, mountaineer, canoe cruiser, or boy scout the compac is the scientifically constructed answer to our needs.

Possibly the rock upon which are wrecked the ambitions of most walking enthusiasts, particularly women, is improper foot covering. Ordinary street shoes are taboo. Moccasins or shoe pacs are right for woods travel, but for most walking the Munson last, korry-krome army shoes are the best. It is refreshing to note the reversal to sane foot covering since the war. And the Munson last has done it. Women *en tour* can get the proper shoes as offered on the market for boy scouts.

Specifically the shoes must be a size larger than those needed for ordinary street wear. This is to accommodate the thick, heavy wool lumberman's socks, which act as a cushion for the feet, and to care properly for wetness from the outside and perspiration from within, to pre-

vent blisters, and to safeguard against chill even though one's feet are soaked in snow water the day long. Further specifications are that the shoe must have a soft toe cap and a broad double sole extending from toe to heel. Have your shoemaker put on this extra sole and stud this with Hungarian cone-headed hobnails, a row just back of the toe, a row over the ball of the foot, and a horseshoe row around the heel. Where much slippery walking is anticipated as on wet logs, grass, or rocks, we carry in the kit ready for such use two dozen No. 7 winged lumberman's screw calks with a small wrench. The sole is painted with copal varnish and the uppers and welt well daubed with melted cocoanut butter three parts and beeswax one part.

Experienced tropical travelers prefer wool to cotton on account of the proper insulation. For personal wear experience proves to be best the knee-length duxbak riding trousers, spiral, wool puttees, army wool shirt, light wool undersuit and an army campaign hat. Instead of a sweater or coat a cardigan jacket or the Filson cruising shirt of forestry green, woolen outing cloth is ideal for it keeps out wind, is warm, and to a certain degree waterproof. A commendable feature of the Filson shirt is the double back which can be used as a small pack sack for short trips and numerous voluminous pockets with snap buttons which harbor many items which one wants to get at quickly.

All woolen articles except the quilt, undersuit, and shirt are waterproofed by lanolin. Before being woven into a fabric, wool is treated to remove the natural oil. By returning this oil to the fibers, they will not swell up when immersed in water; the water simply interposes

in the minute spaces between the fibers and can be easily shaken out.

In the pocket should be found the usual indispensables which all outdoor men carry: a waterproof match box for emergency, the daily supply for the camp fire and pipe being carried in the small watch pocket in the trousers (the general supply is carried in a pry-up lid tin in the pack), a jack-knife, a compass pinned to the shirt (be sure to take one along whether you think you will need it or not; it is good to refer to to keep in practice for the time when you will need it). A notebook with pencil will contain notes on cooking and room for daily jotting down happenings. The Burroughs Wellcome Exposure Calculator, recommended in the photo kit, is in the form of a wallet containing also a notebook, pencil, and pages for the exposure record. A common blue bandanna kerchief has many uses from a neckerchief, a hand towel, to tying down a hat in a hard wind, etc. A U. S. Geological Survey map of the region to be visited should be cut or folded to a 5x7-inch size and slipped into an envelope of celluloid secured from an auto-top maker. Goggles are needed to prevent injury to the eyes from sun glare. Amber (green) glass in metal rims is best, as this color soaks up the actinic rays which hurt the eyes.

The first-aid unit is carried in an empty tobacco tin and comprises a flat packet of Z O adhesive plaster (one inch x one yard) to treat blisters and abrasions of the skin, to repair the rain cape and a possible leak in the camera bellows, to seal baking powder tins and photo film containers from moisture; an ampoule or sealed vial of aromatic spirits of ammonia for inhaling

in fainting and shock; a trench tube of iodine for wound antisepsis; a vial of aspirin for colds; a laxative; aseptic gauze in waxed paper; a tube of analgesic balm; and a snake-bite kit. This last is a wooden tube with screw-cap ends which have at one end a quantity of potassium permanganate and at the other a small lance. When used the lance is sterilized in boiling water and then used to make a crucial incision over the fang puncture, and the permanganate crystals are rubbed in while coffee or other stimulant is given by mouth.

Protection against rain is really needed. The army poncho is commonly used, but the rain cape is better, as it has all of the poncho's good points but protects the arms better, slips on over the arms and pack, yet leaves the arms free and is quite airy underneath. It reaches from the neck to the knees and weighs nineteen ounces.

In summer the two-pound axe with a twenty-four-inch handle is fine for a real wilderness jaunt. On fall or spring trips a larger axe would be needed in view of the need for more fuel for the camp fire.

The housewife is the answer to first aid for mending and it consists of a leather wallet or food bag containing bachelor buttons, large-eyed needles, linen thread wound on a card, sail needles and waxed thread as used by the shoe-sole sewing machines, safety pins, four blanket pins, rubber bands, extra shoe laces, copper split-end rivets, and a small whetstone.

The wilderness traveler doing photography must work under adverse light conditions occasionally and must take a tripod. A rapid rectilinear lens will produce good pictures if you use it right. We are apt to expect too much from the fine, expensive anastigmat

lens; we will use it for most work at f. 6, 8, or 16, and the f. 4.5 is good for the reserve light power we may have need for in poor lighting. I prefer a small size, 2¼x3¼ inches, and if I get negatives worth anything at all they are worth enlarging; and to get detail for enlarging one must stop down the diaphragm and prolong the exposure; and so we must use a tripod.

A general rule for an amateur is to stop down to f. 16 and give one-twenty-fifth of a second exposure; but to be more accurate on all types of subjects under different light conditions use a Wellcome Exposure Calculator or a Harvey Meter. A portrait lens is needed for close work on flowers, etc. Experimenting to get the proper distance between camera and subject should be mastered before taking the trip. A ray filter is necessary to get full color correction in most scenic work. The light in deep woods is hard to gauge without an actinometer such as a Watkins or Trilux. Camp-fire scenes are happy mementoes of any camping trip; they are taken by flash and we prefer the flash sheets to the powder which, if spilled, is lost. If using roll film, order that it be put into waterproof cartons as prepared for the tropics. Film packs are best carried in pry-up tins to exclude moisture.

In considering the hunting unit for knapsack trips we must use a special gun of general utility and light in weight. Stewart Edward White has the right idea when he states in *The Forest:* "During the summer months in the North Woods you will not need a rifle. Partridges, spruce hens, ptarmigan, rabbits, ducks, and geese are usually abundant enough to fill the provision list. For them, of course, a shotgun is the thing, but since

such a weapon weighs many pounds and its ammunition many more, I have come gradually to depend upon a pistol. The instrument is single shot, carries a six-inch barrel, is fitted with a special butt, and is built on the graceful lines of the 38-calibre Smith & Wesson revolver. Its cartridge is the 22 long rifle, a target size that carries as accurately as you can hold for upwards of a hundred yards. With it I have often killed a half-dozen of partridges from the same tree. The ammunition is light. Altogether it is a most satisfactory, convenient and accurate weapon and quite adequate to all small game." Mr. White likely refers to the Stevens make of gun. My personal preference is the Game Getter of two barrels each, single shot, one barrel handling the 22 long-rifle cartridge, and the other, a 44 bullet or shot cartridge.

No hiker should hit the trail into a country where there is a possibility of getting fish without at least an emergency fishing kit—short rigged lines, hooks and minnow hooks, the barbs cut down with a file one half. For more serious fishing the kit will be governed by the species one is after; if for trout take a suit-case bamboo rod or a telescoping metal rod, a single action reel, narrow pattern, twenty-five yards of size E enameled line, a half-dozen best quality gut leaders in an aluminum case, and an assortment of flies in a book, and several split shot.

The essentials in the mess-kit unit are: A collapsible handled steel frying pan, nine-inch size, a deep plate, a quart bucket with a lid, a common pint cup with handle riveted on, a dessert spoon, a fork, and for cutting purposes depend on the jack- or sheath-knife.

The above can be assembled at any ten-cent store. The ordinary fry pan handle should be cut off to a two-inch length and a metal ferrule riveted on to accommodate a stick lengthener at the camp fire. The boy scout outfit, which nests compactly, can be purchased in aluminum, which is in every way desirable, with the exception of the cup, which must be of tin to prevent burning of the lips.

It is hard for the average amateur to provide properly the provisions unit, as he usually makes the mistake of trying to get too much concentration of food at the expense of the stomach. Foods for the hiker must be first of all nourishing, next palatable, and lastly must be light in weight, which means that water must be eliminated. Thus, evaporated vegetables and fruits are a boon to the knapsack traveler. Recent studies of evaporated foods show that many of them lack the vital vitamines so essential to health. All evaporated fruits are O. K., and evaporated potatoes, onions and soup greens are recommended. We figure on a basis of two pounds per man per day. The components for one man one week, without fish and game secured en route, would be as follows:

FLOUR RATION	
Graham flour	32 ounces
Yellow corn meal	16 ounces
Baking powder	4 ounces
Soup powder	7 ounces
MEAT RATION	
Trimmed bacon	48 ounces
Dried beef	10 ounces
Cheese or nuts	7 ounces
Dessicated egg	12 ounces
Butter	14 ounces
Milk powder	14 ounces
SEASONING	
Sugar, in cubes	39 ounces
Salt	7 ounces
CEREAL RATION	
Rice	16 ounces
Two-minute oat food	12 oz.
FRUIT RATION	
Raisins	14 ounces
Apricots	7 ounces
Prunes	7 ounces

DRINKS
Milk chocolate.....14 ounces
Soluble coffee powder 1 ounce
Tea tabloids.....21 tablets

MISCELLANEOUS
1 plumber's candle
500 matches in pry-up tin

NOTES ON CUISINE

Rice is one of the most compact and concentrated of foods, easy to pack and cook and very sustaining. It replaces in food elements potatoes and bulky breakfast foods. Cooked with raisins by adding slowly to furiously boiling and salted water, and cooking for twenty minutes when they are drained of water and set aside to steam and swell.

Sugar must be considered not alone as a sweetening agent but a powerful producer of heat and energy. It cannot be replaced by saccharine, which bulk for bulk is many times sweeter than sugar, but which has no food value and will upset digestion. The cube or domino sugar can be recovered after a spill.

All powdered rations should be carried in balloon-silk paraffined bags; egg powder, butter, and matches in tins with pry-up lids; salt in board mailing cartons, and meat wrapped in cheesecloth and waxed paper.

Excellent soup stuff is produced by taking common canned beans of the corner grocer, spreading them out thin in a broad bake pan, drying them in the sun or in an oven without scorching, and then pulverizing the crumbling crust and packing in a food bag. This is better than the pea-meal soup stocks; it makes a fine gruel or soup and the nourishing qualities of beans are well known.

Plenty of washed cheesecloth provides dish cloths for

the commissary, and this cloth is popular with mountain club members as a substitute for toweling. A bar of good soap which lathers well in cold water and can be used for washing woolens does duty as hand, face, and dish-washing soap.

CHAPTER III

Motor Camping

THE popularity of vagabondage à la automobile is firmly established. One need not reason far for the causes: Most every family owns some sort of motor car or has one at his disposal, which solves the vacation problem of how to "get there", and makes the highway voyager quite independent of railroads, hotels, and garage rentals—cheapening travel. Motoring America is awakening to the necessity of good roads, and even the remoter corners of our scenic wonderlands, which formerly appealed to us as the untracked wilderness, are now feasible for motor vacations. Finally we are changing as a race of sedentarians and stay-at-homes to a people who enjoy the outdoor life and realize the need of recreation for efficiency and longevity—for surely Nature is a better tonic and rejuvenator than any medicine or healing "ism" which man has contrived.

This combination of favorable circumstances has so increased the travel range of vacationists that remote landmarks in our unrivaled playgrounds have become cosmopolitanized and the names of little streams, bizzare rock formations, canyons and the high passes of towering peaks have become fireside bywords. Statistical data from the seasonal reports of national parks' superintendents surprise us in their tabulations of the great numbers of motor tourists who

yearly are putting the "See America First" slogan into an actual accomplishment, and who, by doing it with gasoline, are seeing things right. Cities have awakened to the equipping of special parks and community accommodations for the creature comforts of these petrol tourers, and prosperous towns have sprung up in arid waste lands, solely on account of their being advantageous supply points on some motor highway.

In equipping for motor camping certain precepts govern our choices just as in any kind of camping. The kit must be suited to the means of transportation, and it should be as light, compact and efficient as it is possible to make it. With its weight- and bulk-carrying capacity, the motor car permits the use of an outfit which insures comfortable living, particularly for those who have looked upon camping in general as more or less of a hardship and a deprivation. Yet the motor outfit may be vastly overdone—one is apt to take along too many items, and his choice of what we may call the essentials is woefully unwise.

Witness the daily procession of motor tourists with an occasional flivver moaning under a load of duffle more suited to a truck—young trunks lashed fore and aft, wire bottom, rigid beds reposing alongside, kerosene stoves, which should have been left at home in the kitchen, unsanctimoniously toted on an auto-running board, together with baby chairs, large shovels, and lengthy canvas-covered bedding rolls, heavy bulky tenting stuff, and long poles jabbing the landscape. Individually they undoubtedly present needful parts of our kit, but they could be easily replaced by compact folding equipment.

MOVABLE MOTOR CAMPS

The Amazon Tent (1 and 3) is ideal for the motorist. It can be used with the car or alone.

A bed and tent combined (2)

A bed slung over the seats (4).

MOTOR CAMPING

A simple type of shelter which comprises tent and bed.

Certain indispensables are commonly agreed upon as essentials, hence this is no place to exploit some pet freak in the way of a camp outfit, but rather is it incumbent upon me to tell of an outfit which has stood the acid test—one which has served me well on week-end trips near home, on longer summer vacation excursions in our national parks, and on a year's transcontinental and coastal tour, and one as suitable to a week's outing as a year-long cruise.

To enjoy camping at its best we will steer clear of hotels, cafés, and garage rents, and our nighttime camps will be found in some timbered valley away from the business-frenzied throngs, and this means that one must carry his own bedroom, shelter, kitchen, and provisions. The enjoyment of any camp trip is safeguarded if one sleeps well. With a motor car we have the carrying capacity for a real bed. Some enthusiast has contrived a bed to rest on the backs of the front and rear seats of the touring car, and when the curtains are adjusted this makes a cozy, quickly prepared overnight abode. It you are camping for the fun of it, you will take more time for making camp and will put up a tent.

Most all auto tents are fashioned after the shanty or baker-style tent. This shed-like contrivance in fabric is equipped with an awning or porch flap projecting in front, the 7x7x7-foot size providing ample sleeping space for two cots and dressing and storage room between—the awning extending from the tent to the car giving ample dining or lounging space in inclement weather. The addition of a front wall to the shanty tent fitted below the porch flap turns the baker into a

so-called amazon tent. This front wall is held in place by snap fasteners or tape ties and can at any time be opened out continuous with the tent walls and suspended with tape ties from the edge of the awning, thus increasing the depth by a hall. This style of tent gives ample head room in front, and with a three-foot wall does not interfere with the cot-bed, and gives sufficient roof slant for shedding rain. It is pitched facing the car, either attached to the auto top or independently, as an open camp where one can utilize a large friendship fire in front, reflecting the heat back to the roof and down to the floor.

Many people like balloon silk for the auto tent, but it is now almost prohibitively high in price, and there is really no need for a light-weight cloth where the auto provides the transportation—far better use a ten-ounce, double-filled, cotton duck. A tent of closely-woven fabric sheds rain fairly well, but better if waterproofed, and is neither so heavy after a rain nor does it shrink. A good formula for the process is the one used by the British Army, and described in a past issue of *Outdoor Life* as follows: "Not only the tent, but all guy ropes, must be processed. Be careful to have the cloth free from grease and to soak the sizing or other filling matter out of new cloth. Remember that canvas or other cotton goods shrinks about ten per cent when first wet. Thus, a seven-foot tent cloth, square, of new goods, will, when shrunk, measure barely six feet each way, even with clear water. Recipe: Rain water (tepid), 2 to 3 bucketfuls; add to this 3 or 4 pounds of sugar of lead and 3 or 4 pounds of alum. Soak your tent over night in this; in the morning hang out to dry.

It is now both water- and fire-proof. If thoroughly dry the tent is also mildew-proof. All water proofing has to be renewed occasionally, as the rain slowly dissolves and washes away the only comparatively insoluble mineral salts, alum left fixed in the fibers of the cloth by the sugar of lead or soap"'

By all means secure collapsible tent poles which you can carry on the running board. Most of the tent companies make them. The stakes should be two feet long, of pine, ash, or spruce, with a metal ferrule or band on the end to prevent splintering; we drive them into the ground diagonally from the tent.

Fall, early spring, and high altitude motor camps frequently necessitate the use of a tent heater. For this it is best to use a small collapsible camp stove and small telescopic pipe. It becomes an appreciated luxury and in some cases a positive necessity. Place the stove at the right side of the tent as you enter. The roof hole for the pipe is cut out twice the size of the pipe and a piece of rawhide sewed in. Cut in this the right opening for the pipe.

Some makers have fashioned a combined tent and cot-bed attached to the running board of the car and extending out to uprights which also support the tent, which slants from these up to the auto top. An additional fly extension to the side provides shelter for cooking and dining. Such a tent-bed rolls or folds up compactly on the running board, where it is carried en tour.

The most satisfactory bed rest is the army folding cot. It is comfortable and raised from the ground, thereby protecting from dampness and crawling things. It is

easy to set up and folds into a small compass. The wider styles are the best, for the body of the sleeper in rolling about at night raises the bed covering, and through these air gaps cold drafts enter. Some people prefer a sleeping bag. Under no circumstances should either the bedpad, mattress, or body covering be of cotton, for it is hard stuff to lie on. The batting mats down, gets chunky, and does not dry out well. A wool comforter folded once is the best bed pad—keeps dry and fluffy.

The problem of sleeping warm is to retain the heat which is manufactured by the body, and is best done by covering with an insulator, wool being ideal. A practical, warm, light-weight sleeping bag, commonly used by the mountaineering clubs, consists of a wool batt quilt covered with flannel, folded once, and sewed with twine into a bag on the bottom and half way up one side. The bag cover is of balloon silk or light canvas. If you care not for a sleeping bag, use wool army blankets and wool comforters with a wool-batt pad underneath. But stick to wool. Some fellows elect to sleep directly on the ground, using a canvas bed cover with blankets and pillows within. To accommodate the angular projections of the human anatomy, scoop out small depressions in the ground for the hips and shoulders. Folding tables and folding high-back chairs or small stools complete the requirements in camp furniture.

Another style of camp is the trailer, which carries the lodging on a two-wheeled separate car. When the tent is set up on this car with the bunks on either side, a roomy kitchenette remains in the center. It is very

good, but rather expensive. If mosquitoes bother, the tent front is covered with cheesecloth, and windows are cut in the sides and rear and covered with the cheesecloth. Those who have tried the régime of breaking camp at six or seven, stopping for breakfast at nine, with perhaps a light lunch at one, and dinner at five, recommend it highly.

For cooking utensils and provisions provide a commissary chest to be carried on the running board. It is made of ⅞-inch stuff; size, 26x20; and 10 inches wide. Wooden cleats are placed near top on either end to effect easy removal of the box to a distance from the car in case camp is pitched thus. In this chest you carry the cook kit with kettles nesting, and comprised of the following minimum for two persons: One nine-inch fry pan with folding handle; two-quart coffee pot with spout and bail riveted on; a two and four-quart kettle with lid, granite-ware cups, deep pie plates, and serving bowls, knives, forks, spoons, butcher knife, can opener, patent egg carrier, soap, Old Dutch Cleanser, dish cloths, collapsible canvas bucket and wash basin.

If an open camp fire is liked, use a camp grid, which is a heavy wire mesh supported at the corners by legs to be driven into the ground. This type of fire will accommodate a reflecting baker, with which you can do all types of baking and roasting. The camp stove is preferably of the gasoline pressure kind, generated with gasoline or wood alcohol. The auto camp stove is the best I have seen, producing a powerful, sootless flame and fitting into a tool box on the running board. It is easily handled and can be carried into the tent if so

desired. Lighting the camp at night-time suggests a portable carbide lamp, a common kerosene lantern, or a folding candle lantern.

In computing the grub list we are allowed canned goods, which are taboo in other camping, where transportation facilities are limited. I would carry in the commissary box a choice from the following: One small can of tomatoes, beans, jam, soup, fruit, and six cans of evaporated cream. The ration list for two men for three days can be computed on a basis of two pounds of food per man per day, and can be figured for any length of time with the following table: Bread, one pound (or corn meal, one pound; wheat flour, three pounds); the bread carried in a tin can, the flour in paraffined balloon-silk sacks; fresh meat or bacon, ham and dried beef, five pounds, wrapped in cheesecloth and paper; butter, one pound, in pry-up tin; crisco, one-fourth pound, in pry-up tin; eggs, one dozen, in patent carrier; sugar, one pound, in paraffined sack; salt, one-fourth pound, in paraffined mailing carton; condiments, in original tins; cereal, package of Two-Minute Oat Food or equivalent; potatoes, five pounds, and one onion in cloth sack; cheese, one-quarter pound; steel-cut coffee, one pound, in pry-up tin, and twenty-five tea tabloids.

The tent, beds, and commissary form the party supplies. The personal outfit includes the clothes worn, dress clothes, and extra garments, shaving and other toilet requisites in a good fiber suitcase, allowing one to a person. Where the air is devoid of humidity the skin gets dry and is prone to blister, the hair gets dry and the nails brittle, and cold cream frequently

applied gives much relief. To protect the eyes from sun-glare, provide amber (green) goggles, to be carried on the person at all times. Opticians will supply aluminum cases for goggles.

Better roads and the opportunity of garage service at frequent intervals along the motor highways have eliminated the necessity of an elaborated emergency equipment for the automobile. A precautionary outfit, however, is advisable, especially in the districts west of the Rocky Mountains, where settlements are few and far between, the weather variable and sand to be encountered. Extra parts for the car liable to quick wearage and breakage must be included. Start with four new casings and inners, take two extra new casings and four extra inner tubes, a good pump and jack, a gallon of good lubricating oil, a can of cup grease, extra spark plugs, tube repairs, copper wire and a pint of distilled water for the battery. Bad road conditions, as sand or mud, may call into use on a long tour a rope (fifty feet of three-eighths-inch), a block and tackle, two three-foot wooden planks carried on the running board, an axe, a spade, and a fire extinguisher. An extra pair of chains is good to use on front wheels on wet, crowned roads, as one may be broken or lost.

Springs get hard usage, so fit the car with rebound straps and rubber bumpers, and carry in the tool box an emergency spring-repair kit.

On desert trips one should have an extra three- or five-gallon can of gasoline carried in the Welscho unit for oil, gas, and water on the running board or in a five-gallon can as marketed everywhere in the West. These cans come two in a crate, and after emptying one it can

be used for water for the car and the other can be kept filled with emergency supply of gasoline. The crate is bolted to the running board. The water supply is most important. The supplemental supply for drinking purposes is best carried in a desert water bag suspended in the extra-inflated tire. They must be well soaked a day before the trip starts, and when filled with water the linen cloth fibers allow sufficient slow evaporation of the water to cool the contents, enhancing its palatability. One experienced tourist in the mid-west fills his water bag at each county seat to be certain of a pure water supply.

Sand and mud form the greatest obstacles to travel via automobile. In operating a car in such an emergency, don't speed up and jump the clutch, for this simply spins the wheels and sinks them deeper. Much more effective traction can be secured by retarding the engine and slowly engaging the clutch. The methods used for extraction of a car from sand are to use two stout canvas strips the length of the car (an old pully belt or heavy-meshed checken netting) with large grommets at either end to anchor to wheels and to the ground in front; to deflate the tires to about ten to twenty pounds' pressure to get greater tractive surface, and to wrap the tires and rims of the wheels with heavy rope to gain a greater hold on the sand than can be obtained with chains. Apparatus to pull the car out—to supplant the time-honored mule—is a block and tackle or an adaptation of this—a contraption of chains and pulleys worked with a lever, the Spanish windlass and a hub drum bolted on the rear wheels, over which is

wound a rope anchored ahead, operated like a capstan.

Make up a first-aid surgical and medical kit to go into a metal-bound box as follows: Three iodine trench tubes; vial of aromatic spirits of ammonia for fainting and shock; absorbent cotton, one-half ounce; one square yard of aseptic gauze; a one- and two-inch gauze roller bandage; a vial of your favorite laxative; aspirin; a roll of adhesive plaster, one inch by two and one-half yards; forceps; scissors and safety pins; and a screw-cap metal vial of mosquito dope.

The list described or suggested for motor camping may seem large to one who has never hit a real Western trail, but it will surprise one at the way the items can be stowed away into small compass. On short trips, of course, many things may be left at home, but if you hit the long, long trail, be prepared. Motor camping is relatively inexpensive, replacing as it does hotels and garage rents. It is a most pleasurable form of outdoor life, permitting a vast travel range. It is advisable to rig up the outfit during the winter months in joyful anticipation; then when spring comes, to rig up the car for a trial cruise on week-ends and holidays, setting up the camp and cooking meals to gain proficiency, so that on the long tour camp-making becomes routine and not an unsystematized distasteful chore.

CHAPTER IV

Practical Mountaineering

To persons of sedentary occupation a mountaineering vacation is productive of wonderful new fields of enjoyment. Good health is, of course, essential. One should never attempt a high summit until he has tested his powers on a number of comparatively easy climbs and preferably after an apprenticeship under a skilled instructor. Incessant care, even in doing simple bits of mountaineering, marks the expert. The real romance of the craft has to do with the glaciers—combining as it does both snow and ice work; the rest of it may be catalogued largely as rock-craft. To become a proficient climber one must master all branches.

Naturally, the main difficulty with high altitude work is that of muscular exertion. The ascent of Mt. McKinley presented ordinary obstacles of mountain craft, but getting up depended on a gruelling system of back packing, so much so that in ascending the twenty thousand feet altitude of the peak some sixty thousand feet were traveled, by reason of the necessary relaying of equipment. The novitiate in mountaineering will likely attack a peak which comprises but a day's work or so from the base camp, and thus he is rid of much of the irk of relay supply packing.

The mere effect of attitude is something to be reckoned with. One unaccustomed will find that with very little work he feels exhausted and that efforts to ad-

vance are painful. Some breathe as in a paroxysm of asthma and continually strive to relieve the chest of the weight which seems to load it down. The heart runs like a trip hammer and it is with difficulty that unwilling knees are forced onward and upward. Fortunately, one recovers after a brief rest and is able to proceed. Indeed, view and air are so exhilarating that exhaustion is only temporary—one feels as good as ever after each short rest.

The personal equipment for climbing must be the last word as to what is best for efficiency and comfort. Since mobility is the criterion of walking ability, the feet receive the first attention and footwear is accorded the most important place in the selection of an outfit. Next the foot one wears snug-fitting summer cotton or silk hose, which take up the friction between the foot and the outer covering of heavy all-wool, knee-length socks. Experience has proved that this prevents the formation of blisters and guarantees proper warmth. One must not skimp here either in the quality or quantity of goods—the socks must be thick and a good fit without wrinkles. The proper walking shoes or boots are doubtless the hardest article in the equipment to secure. They must shape easily over the heavily-clothed foot, be broad at the toes and preferably without a toe cap. The soles should be one-half inch in thickness, and this thickness should extend from the toe along the instep to the low broad heel. The ordinary walking over rocky trails is death to leather, hence Hungarian cone-headed hobnails are to be studded over all exposed heels and soles for protection. Likewise, the hobs are necessary to prevent slipping,

particularly on grass. It is a mistake, however, to have these nails as thickly studded as is common. The correct alpine shoe has special nails clamped out over the edge. In addition for ice work on the glaciers and in the snows of the higher slopes screw calks are imperative, and a set of size No. 7 winged lumberman's calks with a wrench is tucked into the pack to be ready for attaching when needed. Only a thick heavy sole will hold these calks. A height of six inches is best for the mountain boot. The leather and stitching must be first-class.

The underwear also should be of wool, and of a weight suitable for winter. Suits should be of such durable outing cloth as Forestry green. This is a warm, wearable, nifty fabric, being made up for men into knee-length, army-style, riding breeches and the army-style or the excellent Filson cruising shirt with its many useful pockets; and for women loose-fitting blouses and bloomers and take-me-off-on-the-high-climb skirts.

Most any old floppy hat does duty in the mountains; it is only strictly specified that it have a broad brim and be able to shed water—other than that we don't care, so long as the other fellow doesn't. A soft brim is easiest to tie down in a hard blow. The inclusion of a mosquito head net and cloth gauntlets guards against insect pests, which may be an obstacle harder to surmount than any problem in climbing or transportation.

To prevent injury to the eyes from snow-glare, amber goggles or glasses are essential. Bishop Stuck, conqueror of Mount McKinley, found those of amber tint to be entirely satisfactory. The frame must not

fit over the eyes to the exclusion of air, because of the condensation of moisture, and on no account use celluloid, as it is so inflammable; an accidental spark from the camp fire or pipe match might quickly ignite it, to the detriment of the eyes. No metal of the frame should touch the skin. Black grease paint, such as actors use, is smeared over the cheeks as a protective against snowburn, and a liberal supply of cold cream is then later used to remove the paint.

In the pockets should be found a good jack-knife, a compass, and matches in a waterproof matchsafe. Provide for carrying lunch a light rucksack with shoulder straps having single point suspension, and adjust it so as to get the center of gravity low. In it you will carry, among other things, a lunch which must be concentrated, portable, and capable of yielding heat and energy and intended simply to tide you over an emergency.

Lack of sugar will be noticed more than any other missing article of food, for it furnishes heat and energy so quickly. Sugar in domino-shaped cakes is easily toted about and handled, so include a handful in the pack. Caked sweet chocolate is another popular lunch item, and I know one famous mountaineer who swears by common seedless raisins to the exclusion of all else.

A roll of adhesive plaster (one inch by five yards) will prove useful in many ways; a tin cup of one-half pint capacity is handy, and such photographic equipment as you desire will all pack nicely in the light waterproof sack.

About the neck a silk kerchief is loosely worn, for convenient mopping away of prespiration and to be

dried by sun and wind, and which, as you reach the colder wind-swept heights, may be tied over the hat and ears and under the chin. A good sweater is a further safeguard against cold. The coat cut kind, and of thick soft wool, is best.

On a pack-sack trip you must carry lodging requisites. The heavier pack harness or Duluth pack-sack is essential for larger loads. The camp site will be wherever you find a level spot near good water. You "hang" your hat on the ground or jab the Alpenstock in the dirt as the sign of possession (if with a party) and proceed to make camp.

A shelter is really needed in alpine regions, which are so subject to passing showers. It may be simple in the extreme. An eight by nine, water-proofed, balloon-silk shelter cloth is quickly suspended with the aid of a light rope and the ice axes, or you may use one of the various shelter tents, which will completely fill your wants.

The nights are cold in the mountain land, the thermometer often registering about thirty to forty degrees, and often there is ice along the streams where morning ablutions are performed. For sleeping purposes blankets are ruled out, as they are too heavy. The popular bed is a sleeping bag made by folding an all-wool or down quilt once over lengthwise and pinning or sewing along the bottom and halfway up one side. A similar shaped bag of water-proof balloon-silk covers this and keeps the heat in and the cold out.

What we may consider as the final item essential to the mountaineer's walking equipment is the Alpenstock. The conventional Swiss ice axe is not in general

use by the climbers of our West. It is, however, well to have one or so in a climbing party, and it is a real necessity if steps are to be cut in the ice for foot-holes. In a party headed by professional guides or experienced amateurs, no one is allowed on the ice without at least the Alpenstock, which consists simply of a garden-rake handle with its steel ferrule, to be purchased at any hardware store, provided with a sharp steel point driven in and held by the ferrule. An inch or so from the opposite end is bored a one-quarter-inch hole through which is secured a yard of rawhide lacing, whose free end is looped over the carrier's wrist. In use it is kept on the climber's uphill side always. On a steep slope the instinct is to lean forward for safety, but this is fatal to your balance. Set the feet firmly and hold the body vertical.

The exigencies of the climb before you will determine the need of a rope. The beginner may be forced to cross steep glacier slopes or crevasses, when it is well to be attached to his companions by twenty or thirty feet of first-quality rope. Its use calls forth expert team work and it is a necessary precautionary measure in realizing the urgency of safety first. The rope in climbing is your lifeline, and its proper use, though simple, calls for close attention to detail.

CHAPTER V

Hints on Desert Travel

PART I

THE desert is a land of extremes. It is the region of sandy wastes; a botanical paradise with a peculiar flora which thrives in an apparent absence of water; a land of remarkably clear air and lying distances; the biding place of the alluring apparition—the mirage which mockingly beckons the thirst-crazed wanderer on farther into the dread solitude. The uninformed and poorly equipped adventurer, who attempts to blaze his own trails, meets with unusual perils, turning the primitive pathway into a Camino del Diabolo. But the desert may be safely traversed by one versed in desert-craft and who knows where he is going. This bizzare region is our last frontier, and as men come to really *know* it, it offers novel experiences and certain security to Touring America.

Desert travel has been so accursed that in the past few people attempted it for pleasure; sometimes they went "in" for health, since the dry atmosphere and higher altitudes bring succor for the cure or staying of the processes of certain human ills; explorers in search of precious metals demand a minute knowledge of how to get in and get out of the desert alive, and hints on desert travel are of particular moment to the vast army of motorists who yearly cross the intermountain region.

Persons contemplating a desert trip are particularly

BLAZING WILDERNESS TRAILS

1. Blazing trails into the remote mountain wilderness is often impossible without knapsacking to the rendezvous at the base of some peak.
2. To guard against slipping into a crevasse the alpinist utilizes his alpenstock and is guarded against danger by screw calks in his shoes.
3. A serac bears a striking resemblance to a huge ice cream cone, but it is a real menace to the mountain climber.

Photos by Harmon. Courtesy Canadian Pacific Railway.

MOUNTAIN CLIMBING

1. Experience is the dictator as to the proper dress for mountain climbing.
2. Loose rocks are an ever present source of danger to the climber.

Photo by Harmon. Courtesy Canadian Pacific Railway.

interested in the present status of desert trails, what perils to avoid in view of the many published reports of deaths, what particular equipment one needs, what to do if lost or athirst, and how to extricate a motor car if stalled in the sand.

The main motor trails across the Mohave and Nevada deserts located in Southeastern California and Southwestern Nevada (the great basin with its subdivisions known as the Colorado, Mohave, and Death Valley regions) are fairly free from danger. The road bed is practically good, it is well sign-posted, and at advantageous points are located supply stations for man, motor, and mule. But even then some special supplies are needed and certain items of emergency equipment are advisable. Those whose business or bad luck takes them off the beaten tracks must know what perils they may meet, how to avoid them, and how to safely overcome them.

A knowledge of the topography and geography of the great desert is the first essential. Get a reliable map. One highly regarded by prospectors and desert travelers is the Fred T. Perris map of Riverside and San Bernardino counties, south of Death Valley. This valley has been mapped and sign-posted largely through the efforts and encouragement of L. W. Beck, who relates an incident to show the needs of sign-boards in the remoter districts. "Some years ago, right in the heart of Death Valley I found three men stone dead at the base of a butte. On the other side of this butte only a few minutes walk from where they had died was a living spring. These men were looking for water when the desert killed them."

The trails are fairly well marked, but the region is treeless except for an occasional oasis. The main routes of travel are given in the U. S. Geological Survey Water Supply Paper No. 224, Fremont's Trail, the Old Spanish Trail, the Mohave-Keeler Route, Death Valley, Bullfrog and Victorville Routes.

The Southwest has a diversity of altitudes ranging from several hundred feet below sea level in the Salton Sea to eleven thousand feet altitude on some of the peaks in the San Bernardino Range. Dry land below sea level is only possible where the evaporation exceeds the precipitation. Such spots are rare and only found in desert regions. Between the irregular horizon of rocky elevations are the desert basins where the land slopes toward a central depression. They have no streams to carry contributions to the oceans, but all snow and rain is returned to the atmosphere either directly or into lakes or so-called "sinks".

In these sinks the water carries mineral deposits, which in the dry state may cover several inches deep as an efflorescence like drifted snow. These sinks are desert wastes, shunned by all forms of animal life, and only inhabited by salt-loving plants. These chemical sinks are known as dry-lakes, playas or mud plains, borax lakes, salt lakes, and alkali marshes.

Desert sinks and their waters are of interest to the traveler whose life might be spared through a proper understanding of them. A sink is a great evaporating pan. If rock-floored or it has a confining layer of clay or fine sand, water may be impounded and can be revealed by very shallow digging. It is best to dig at the edge of a mud flat or playa, as water is not so alkaline

there. As a rule, water at high altitudes comes from rocks free from alkalies and is pure and sweet. Mountain springs are small and the majority disappear during the drier periods, but after a storm water is abundant. In lava or granite ranges, water from winter rains often collects in rock bowls or "tanks" and when in shade and protected from the winds may not be evaporated for months, but this is rare.

The difference between the tropics and the desert is the humidity of the former. In the desert the water is so scarce and the evaporation so excessive that unusual dryness results, and so much so that dead animals when left on the ground to decay do not wholly but dessicate. The phenomena of hot days and cold nights is explained by the earth's absorbing heat rapidly from the sun in the day time and giving it up at night, for there is no blanket of moist atmosphere to retard its escape. The average desert rainfall is three to thirty inches; its evaporation is one hundred inches.

The desert is not, as the uninitiated might suppose, a monotonous waste without verdure. The tourist on his first visit to the land of little rain finds the sandy stretches literally teeming with vegetable life, but of a flora peculiar to the region of intense heat and a scarcity of water. Except at water holes each specimen is separated from its neighbor by several feet, for the infrequent desert rainfall is not sufficient for more. Desert vegetation is the only practical guide for the traveler hunting a water supply. A great mass of verdure would indicate an open supply of the precious fluid.

Particular knowledge of certain species of plants shows the possibility of obtaining water near the surface. One plant called the "well of the desert" furnishes a potable liquid itself and is really the most valuable plant the desert tourist can find. It is the Bisnaga or barrel cactus—cylinder-shaped and green, thickly covered with sharp spines (desert plants have particular protection from enemies, either they are armored with lance-like projections or contain a malodorous, bitter, or poisonous sap). Each plant will yield a gallon of cool, rather sweetish but quite palatable water by cutting off the top with a long-bladed knife, pounding the center pulp forming a bowl which quickly fills. This plant has been a life saver for many a thirsty traveler, and a number of instances are recorded where men ignorant of its properties have died of thirst in the midst of them.

Tules or bullrushes always indicate water, generally of good quality, at or very near the surface. If one finds a dense tangle of arrowweed at a height of six to eight feet, he is most certain to find water if he digs underground within twenty feet, for this plant exists only near a water supply. Salt grass indicates water near the surface but it is usually brackish and not very potable. Vegetable growths which advertise a *lack* of water are creosote and others of the greasewood family all growing in the driest of soils. The omnipresent mesquite grows profusely if near a water hole, but it is not to be taken as a guide for it may depend upon periodical flooding or ground water as far as fifty feet below. Of particular, though chiefly scenic, interest and which link the mind of the traveler in-

separably with the desert are those silent sentinels, the giant cacti with the accordion plaits and the organ-pipe cactus or saguaro.

The water supply on the desert is most important. The railroads have water stations every ten to fifteen miles, and crews have instructions to give help to anyone there on the desert. The writer on a motor trip over the Mohave Desert found water easy to get as the trail followed closely the Sante Fé Railroad, but gas stations were few and far between, and one experience taught the lesson to fill all tanks to capacity wherever procurable even if only a gallon short. The multitude of chuck holes retarded the speed of the car, necessitating much use of low and intermediate speeds and consuming an unexpected amount of gas until finally we stalled within a half-mile of a railway tank station. We were ten miles from a gas-filling depot. While planning to leave the wife in the car armed for rattlesnakes, dust storms, and tramps and taking the next freight to a town "back there" for gas, a queer-looking outfit drove up. On a chassis had been rigged a platform on which was carried a regular dentist outfit, and the driver informed us that he was a dentist making the outlying desert towns. He gladly spared us a gallon of gas which he siphoned out of his tank with a short rubber hose, starting the gas flow by sucking one end of the tube.

The location of wells and springs off the main motor highways must be mastered before anyone starts on a trip. An inexperienced man should never enter the desert alone. If he can not get a companion who is qualified he should study his route beforehand and

gather all the local information to be had, then proceed with the greatest caution, transporting an abundant supply of food and water and never leaving one water station without a definite idea of the next. These water holes are few in number and irregularly distributed, in some places in groups and elsewhere thirty to fifty miles apart. A detailed description and mapping of these life-saving springs, wells, and irrigated areas of the great desert of California and Nevada are contained in the monograph of the U. S. Geological Survey entitled, "Some Desert Watering Places".

The so-called "Poison Springs" said to contain arsenic have been reported and W. C. Mendenhall, of the U. S. Geological Survey, investigated them and he states that in not one did he locate arsenic but instead large quantities of Glauber's and Epsom salts (universally used laxatives), which the waters in their subterranean passage took up as a solvent and then issued through fractures in the earth's crust. These salts *act as poisons* to the famished prospector, who, in his exhausted and feverish condition, drinks without restraint, which is usually fatal.

Travelers must figure on two gallons of water per day for each man, and a proportionate amount for horses or motor car. It is best carried in large one-gallon canteens, in especially constructed, rectangular, galvanized tanks, in twenty-gallon barrels or casks. The most practical way and suitable for wagon, motor car or pack train is the five-gallon, rectangular can in which gasoline is marketed all over the West. They come two cans to a light wooden crate, and I have the crate bolted to the running board of my car. I keep one can

MOTORING IN DEATH VALLEY

1. Near Ashford Mill, Death Valley. What alluring names the desert offers—Death Valley, Funeral Range, Skull Valley, Furnace Creek, Dry Lake, and Poison Springs. Yet there is a lure which becomes your master if you travel in this wonderland *rightly*.

2. The summer shade temperature in Death Valley reaches as high as 130 degrees F. and July, August and September are the prohibited months for travelling. Early spring or fall is the time for a rather nice trip, but take plenty of water and provisions along.

TEEPEES

Piegan Indians, Lake St. Mary, Glacier National Park.

full of gasoline for emergency supply; empty the gas from the other can and fill it with water. Cans carrying gasoline should be painted red as a distinguishing danger mark. The advantage of the five-gallon cans is their ease of handling and the small loss if a leak develops and you are carrying much water.

George Wharton James, in his *Wonders of the California Desert*, describes the unique and practical method of water carrying and cooling made possible by the rapid evaporation of surface water. The liquid is put into what is called an *olla*, which may be either a porous pottery jar, a lightly woven Indian basket, or a stout canvas bag which, when hung up, is in the shade where a breeze strikes it. The slight seepage of water which filters through the pores of the vessel is enough to moisten its surface and evaporates as fast as it gathers. This principle is fundamental in most of the modern refrigerating systems. Water thus cooled tastes refreshingly good and is perferable to ice water as a beverage, if such were procurable on the desert. The Desert Water Bag marketed everywhere is made of tightly woven linen and fitted with a bottle mouthpiece at one top corner with a cork stopple and a sling rope. En route it is lashed to a top bow of the motor car where it swings free and is always in the shade and breeze. Water boiled in the evening and filtered and put into the bag is found next morning to be cool and fine. When starting on a trip, this bag must be well saturated to swell up the fibers so that it will not leak.

Procuring water on the desert is an important consideration for the tourist, and he must know how to

render impure water healthful and potable. Heat favors abundant and rapid growth of minute forms of animal and vegetable life in waters which are not too saline. All such supplies should be boiled a half-hour, then the foreign débris filtered by pouring the boiled water through absorbent cotton held in the cleansed hand or through a metal funnel taken for the purpose. Remember that a filter is only cleansing, not purifying; so if the water is doubtful, play safe and boil it. The army method for purifying water in the field is to add a chlorine liberating chemical which kills the germ life and then passes off as a gas into the atmosphere, leaving the water pure with perhaps some harmless débris at the bottom. The most practical application of this method for individual use is the chemical marketed under the name of HALAZONE, which is effective even in dilutions of 1 to 500,000 parts. One Halazone tablet added to a quart of water and left twenty minutes renders a clear liquid safe for drinking.

If boiled water is distasteful, shake it up with a little air in the canteen—aërate it, in other words. Alkaline water is most commonly found on the desert where the precious fluid has acted as a solvent to mineral deposits. It can be made potable by neutralizing with acid after the method described by Horace Kephart. He states: "When traveling in an alkali country, carry some vinegar or limes or lemons or (better) a glass-stoppered bottle of Hydrochloric acid. One teaspoonful of hydrochloric (muriatic) acid neutralizes about a gallon of water, and if there is a little excess it will do no harm but rather assist digestion. In default of acid, you may add a little Jamaica ginger and sugar to the

water, making a weak ginger tea." We might add that this tea is good for colic resulting from drinking alkali water.

Frequent drinking en route is harmful. You will get greater endurance and freedom from annoying thirst, which attacks one who is constantly taking a pull from the canteen, by drinking much in the morning and evening, but little at midday. A personal canteen, such as supplied to the army and procurable from dealers in second-hand army supplies, should be on the person at all times even if one goes but a short distance from the outfit or camp. If this metal bottle is felt-covered and is kept wet, the evaporation will cool the contents. Mixtures, which act as quick revivers of energy and at the same time are nourishing, are raw oatmeal or milk chocolate and sugar in water. Both render tepid water more agreeable to the palate.

Getting lost amounts to a genius with some people, and such should stay off the desert unless they are with a "personally conducted" excursion! Others are gifted with the "bump of location" or geographic instinct and never get lost. Losing one's way is the greatest peril of the desert, consuming time and the food and water supply, and not until one experiences it does he come to really know how mercilessly the scorching sun seems to verily dry the very blood of the luckless traveler. Alkali dust adds to the torture, parching the throat, stinging the nostrils, inflaming the eyes, and adding to the thirst—a combination of circumstances which, no wonder, drives men into delirium. It is *panic* which the desert traveler most fears, in which he loses his sense of direction and

rushes off to some mirage or aimlessly wanders as the dreams of his disordered mind direct.

In desert travel the map, compass, and an ample water supply are the essentials. One must become used to the unusually clear air and the resultant exaggeration of details which make distant objects look near. One should pass no landmarks without studying them from every point of view for possible later need of recognition. Travel should be made to a fixed object such as, landmarks, the sun by day, the moon or stars by night. When lost, sit down and study the map and compass and try to orient yourself. If you wait until night, your thirst will be less and your endurance greater. A signal fire might help.

A desert tour has no terror for the traveler who stays on mapped and sign-posted routes; but if he unwittingly gets off the beaten trails and gets lost, he should be acquainted with the methods which the expert desert craftsman employs to meet the emergency.

CHAPTER VI

Hints on Desert Travel

PART 2

DESERT travel for the casual tourist who joy-rides on well sign-posted routes is quite safe; but men, whose business takes them far into the desolate wastes, or persons who might get lost, should understand what the desert has in store for them; they must know how to meet emergencies and they must carry proper desert equipment. The Automobile Club of Southern California has done sign posting in the desert regions which is surpassing in its completeness. In the spring of 1921 they placed four hundred new signs leading to and within Death Valley on the south. Their representatives now consider the one-time unknown and much-feared expanse rather a "nice place for a spring or fall vacation".

Doug. Rhodes, who posted the charting work in the valley, says that a tour into this region during the spring months equals in many ways a trip into the Yellowstone. Splendid roads, with the exception of a few miles across the "Devil's Golf Course", make the traveling easy, and the new metal signs which will make the valley absolutely foolproof, will in all probability draw dozens of tourists. Provisions and gasoline in small quantities are available at Ryan, Shoshone, and Death Valley Junction, and it is advisable to fill the fuel tank to the top before going in between Panamint and the Funeral Ranges.

Traveling in the other desert country of California is practically the same as it is in Death Valley, only not *quite* so hot, according to Ernest McGaffey. July, August, and September are all prohibited months, he states, and it is best to travel two automobiles together, for the simple reason that houses are pretty few and far between and the means of communication somewhat limited, and such difficulty as a broken part requiring replacement would place the motorist in an uncomfortable position unless there was another car to send for it. It is *always* desirable to carry plenty of drinking water and some spare provisions. Spare tires, of course, and extra gasoline and oil must be included. If a sandstorm comes up, lay by, and don't try to travel in it. Take a couple of shovels along to dig out with if necessary. There are water holes along the roads at places, and these are marked with the signs of the Automobile Club of Southern California. Traveling in the winter months or early spring is safe enough, if these precautions are taken.

A party going fifty miles into an uninhabited desert region must take along everything needed, to the minutest detail—which means water and food for people, water and gasoline and oil for motor cars, and if there are horses, hay and grain and water, for there are but few places where such can be secured. In selecting groceries, follow standard grub lists with much tinned stuff if transportation facilities permit. Certain items are especially good for desert travel—canned tomatoes are a good substitute for water and quench the thirst better; allow a good supply of evaporated cream which counteracts the irritation of the digestive tract caused

by alkaline water. Exclude such thirst-producing things as beans and salted meats. It is well to have a tent fly to protect from the sun in daytime and possible dew at night. Folding cots are best as they keep one off the ground away from reptiles, otherwise use a cowboy-style bed—a canvas sheet long enough to go under the bed and fold back over the head as a protection in sand storms which often become quite violent, but which go down with the sun.

If you expect much walking provide yourself with double-soled shoes, twelve inches high and a size larger than those used for street wear to accommodate a pair of thick wool socks acting as a cushion for the feet. Light weight all-wool underclothing equalizes temperature changes best. Goggles are absolutely necessary —the amber color is preferable, as it neutralizes the actinis rays of the sun which do the harm to the eyes.

Hornaday considers the outfit which his party took on a desert exploration trip to be as perfect as any which ever hit the trail. He and his companions started in a car, then took a wagon, and finally mules and horses. They carried forty gallons of water in four light, wooden cases, each holding two five-gallon cans of water. The individual outfits weighed each about thirty-six pounds and consisted of the following units—sleeping bag, canteen, rifle, binocular, camera, and medical kit.

The ideal camp site is at the base of mountains where one can get into the canyons for water and as a cool retreat, sheltered from the high winds and storms. Camping in a basin or canyon might mean disaster from the visitation of torrents which originated miles

away. A camp fire is a luxury, unless one is in a dense growth of desert timber and away from the main routes of travel.

Travel into the remoter districts, as on a prospecting or a hunting trip, necessitates the use of pack animals. For this purpose select horses accustomed to this kind of travel, as the hot, sandy roads disturb the dispositions of those unused to it, and many of them weaken from drinking the alkali water. On packing trips, experienced prospectors and hunters select burros on account of their endurance of thirst and heat, their foraging abilities, and the small amount of care which they need; they are objectionable because of being slow and they cannot carry heavy loads. Your guide on the desert will admonish you not to expect more than a walk (two or three miles an hour), not to travel in the heat of the day, and to trust implicitly in your animal's sense of smell, particularly when trailing for water. Should a pack animal get a snake-bite, puncture the flesh about the bitten part and rub in well with the finger tips common ammonia.

The accessories for the motor car should be especially chosen for use in getting out of the sand or mud if stuck—an axe, a good spade, a jack, and apparatus for extricating the car. The following methods are in vogue:

One punster has it that "sand is useful in the crop of a chicken, permissible in the disposition of a man, and an anathema in the path of an automobile." But no desert traveler jokes about sand. To him sand is his arch enemy, and a battle with it is a contingency to be met with often, particularly in the western arid portion of our continent.

HINTS ON DESERT TRAVEL

Sand varies from that coarse granular sand, making easily negotiable tracks, to the pure, light, fluffy "flour" sand which is the plaything of the winds. Imagine taking a bushel of flour and letting a flat iron drop into it—it sinks as in water and you have an exact parallel met with by tourists from Needles to Barstow on the Mohave Desert route at the time of the Oatman (Arizona) gold rush. Large trucks had dug chuck holes every few feet, and these were filled level to the top with fine sand into which our wheels would drop with violent lurchings and wrenchings, which made every car we met noisy from the squeaky wheels due to the dryness and the side swing. On this desert road we had to keep on the track, for, if off, we had to employ some one of the regular means of extricating the car. We met one hunter returning from the White Mountains who was stuck at the side of the road and who had, in trying to gain tractive surface for the wheels, sacrificed his coat, sleeping bag, and floor mats but to no avail.

When the car gets to ploughing in the sand, shudders, and stalls, the driver instinctively speeds up, jams the clutch, and tries to shoot through, but the wheels usually sink deeper while they spin in an effort to take hold, all the time throwing a shower of sand like a dog frantically digging for a rat. You are practicing the gentle art of "doodle-bugging" but are not getting anywhere. The proper handling of a car in such an emergency is a slow engagement of the clutch to get surer traction, which will enable you to get through a short sand stretch. When hopelessly stalled, it is necessary to employ one of the several means of extrication of the car.

This brings us to the physics of rear-wheel traction. Consider why a sixty-horsepower car is unable to yank out of a miserable sand or mud hole, and we find that it is not the pulling power at fault but the traction surface of the rear wheel and the road. Every car is a friction drive—the contact point being a small area through which all the power must go—this being only a small space for a 30x3½ casing, viz., 3½x2 inches. Tractors get more certain traction because of a larger contact surface of the wheels to the road and a slower engagement of the power. When a car is stuck in the sand or mud, we must increase the point of contact of the rear wheels and the sand, or enable the wheels to grip better.

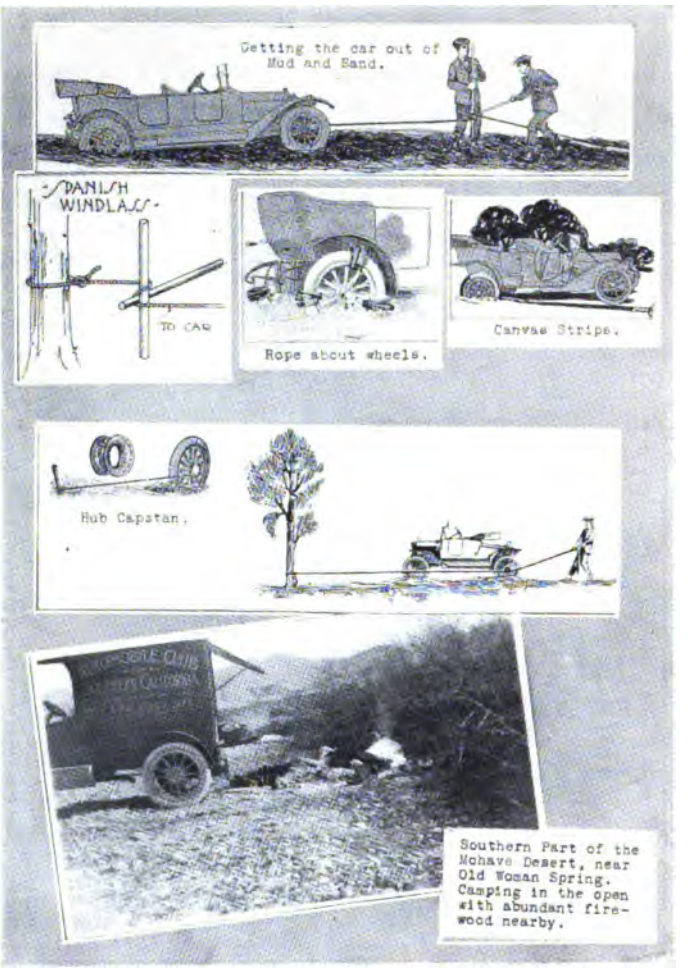
The following methods are successful: Dig a trench in front of the wheels for them to fall into for the initial start. To get greater tractive surface, the simplest way is to deflate the tires twenty or thirty pounds, thus allowing the car to ride over, rather than plow through, the sand. Another method is to wrap rope around the wheels. Chains are not of much avail here, as they are of such small diameter.

Changing the tractive surface is accomplished by using three strips (taken for the purpose) of stout canvas, old pulley belting or chicken-wire netting, a foot wide and each one the length of the car. Two of these are placed under the jacked-up car, one end is attached securely to the wheel and the other, fitted with grommets, is staked to the ground ahead of the car. As the car moves ahead, the third strip is used. Some transcontinental tourists have advanced the idea of taking planks the size of the running board to use as a bridging across bad holes.

STUCK IN THE MUD

1. A river bottom mud hole with car in to the hub. 8 year old girl operated the pull-out device.
2. How the hook end of mud chains are put on drive wheel.
3. Getting out backwards.
4. Chain automatically unhooks from stakes and is in position to be attached to the tire for the road after pulling out of the mud hole.

THE DUBLSERVIS PULL-OUT SET.



DEFEATING THE ARCH ENEMIES OF THE MOTORIST
SAND AND MUD

One car, touring through drifts of winter snow in Bear Valley (California) at an altitude of eight thousand feet, utilized the principle of the plates on the wheels of the caterpillar tractor. The tires were removed with the rims and replaced by rims upon which were attached small, flat boards to act as miniature snow-shoes. They effectively kept the wheels on the surface where tires would sink nearly out of sight.

Extricating the Motor Car Out of Sand and Mud

The Hub Capstan.—Anchor the rope ahead of the car, run a loop around the rear hub (some cars will need a specially made hub cap to retain the rope), the free end being held taut by someone taking up the slack, or the rope can be wound about the drum and tied to a spoke. The driver starts the car, the spinning wheel winds the rope on the drum, and the car pulls out. This windlass method is very powerful. It is well in some cases to also lock the differential, especially if one wheel is on good road. The handbrake is put on fairly tight to destroy the action of the differential, or the mired wheel is fastened so it cannot turn, the power of the engine applied, and the other wheel on the solid track does the work.

The Spanish Windlass.—This is an improvised block and tackle, well illustrated by a simple contrivance at home. Tie a cord to a flatiron on the floor and the other end to a table leg. Midway on the cord hold a broomstick upright; now take a stove poker and loop it around the cord and the stick and turn the poker as a windlass. On winding, the flatiron moves forward—the stick being kept free to move along. This is a

powerful lever, giving a short bite with a great pull, and the longer the poker, the greater the leverage—the greater the power.

In actual application, the motor car supplants the flatiron; saplings or gas pipe, the broomstick and poker; and a strong five-eighth-inch rope, the cord. The fixed end of the rope in the front of the car is attached to any kind of a "deadman"—to a tree, a telephone pole, a timber buried crosswise to the line of pull, or to a series of three pegs driven into the ground.

A block and tackle is good, if you have enough man power to operate it. A metal block is less cumbersome than a wooden. A much more powerful outfit, and one easily worked by one man, is the pull-u-out—a little device consisting of a ratchet crank, a forty-foot steel cable (this can be used any time also as a tow-rope), two seven-foot hitch chains, and several stakes. When the car is mired, the stakes are driven into the ground in front of the car, the hitch chains and cable are attached between the car and the anchorage, and the car is extricated by giving the ratchet a few turns. The device is also useful in jacking up the front or rear of the car for inspection, repair, or painting underneath. It, in reality, supplants the time-honored mule.

No motor tour should be undertaken without two sets of chains and the extra repair links. They are mighty handy if one chain gets lost and occasionally the front wheels need chains for security in guiding the car on wet, crowned roads; they can be used as tow-ropes and are a part of the double-service pull-out kinds which so effectively get cars out when stuck in the

mud or sand. The chains are attached together and laid along the track under the jacked-up wheels; put the end near the rear wheel around the tire and fasten between the spokes securely; the free end in front is staked to the ground with special pegs. This kind of anchorage utilizes the ground friction against every link of the chain and cross members—friction created by the strong downward pressure under the heavy wheels. If advisable to pull out backwards, attach the chains for each wheel, stake out behind, and apply the power.

No one should attempt to follow wilderness trails without a knowledge of personal hygiene and how to treat the commoner accidents and illnesses—heat exhaustion, sunstroke, burns, bruises, wounds, snake-bite, the use of the tourniquet, what to do for fever, chills, constipation, diarrhœa, and a knowledge of elementary surgery. A simple first-aid kit will suffice —a tin box is a good container, and provide in it trench tubes of iodine, aromatic spirits of ammonia, cotton, gauze, adhesive plaster, scissors, safety pins, and a snake-bite kit consisting of a lance, potassium permanganate crystals, and a stimulant.

Personal hygiene in desert travel borrows many precepts from the tropics. In a word, the most important thing is *temperance* in all things. Free perspiration on the skin is highly desirable, as the rapid evaporation cools the blood and goes a long way towards preventing heatstroke and sunstroke. Keep the head cool, the feet dry (no trouble in the desert), and the bowels regulated, and one has no fear of sickness in any climate. The desert should be avoided in mid-summer

where the thermometer jumps often to 125 degrees. The shade temperature in the Salton Sink and Death Valley is 130 degrees F. in mid-summer, during which time men exposed to the sun's rays without water quickly perish. Provide clothing for extremes of heat in valleys or sinks and cold in the higher altitudes. As to the color of clothing, choose white, yellow, or khaki, for experiements have proven that the difference in temperature under black and white cotton drill is 32.6 degrees. Broad-brimmed gray felt hats are good, or one may borrow the idea of the English in their tropical possessions by using the big opaque cork-lined helmet, with its ventilating space all around and a hole at the top which effectively keeps the sun off the head.

To keep the stomach and bowels normal wear a woolen band, ten inches wide, about the abdomen. To drink after several hours of extreme abstinence is almost certain death. Many a strong man has used every atom of will power at his command to urge himself on to water, only to die in torture by drinking too heavily of the precious liquid. Sunstroke, heat, or thermic fever is characterized by a hot, dry skin, the face is congested, the veins are swollen, the arteries throb, and the fever ranges from 105 degrees upward. A patient so afflicted should be moved to the shade, if possible, should be divested of his clothing, and cold must be applied to his head and body for twenty minutes, followed by a brisk rubbing of the skin to speed up surface circulation. Hot tea or coffee do the stimulating act very well. For inflamed eyes a good wash is salt water or a mixture of boric acid—a teaspoonful to a cup of strong tea and use hot in the eyes.

Cold cream or lanolin is fine for the skin, which gets dry and blisters where the air is devoid of humidity.

Snakes seek shelter from the sun and might be found under blankets or tarpaulins, hence always shake them out before retiring, and give anything under which they might hide a kick before picking up. The frontier method of treating snake-bite is whiskey internally and a chewing-tobacco poultice. The whiskey theory in snake-bite is exploded, for if given in sufficient quantities the patient has a good chance to die from acute alcoholism. The life of a person bitten by a venomous snake depends upon what is done during the first hour. The poison is either quickly eliminated and the patient rapidly recovers, or it is taken up by the blood stream and carried to all vital organs and rapidly destroys life. Time, then, is all important, and one should understand how to care for this emergency. The method of treatment is given in the chapter, "Taking the Place of the Doctor".

CHAPTER VII

The Camp Cuisine

EXPERTS on outdoor topics agree as to the average essentials making up the camper's food lists, but these men vary in their recommendations as to the amounts of each article to be taken. The subject is important, for upon it often depends the success of the expedition, and so radical a change as one experiences from the home cuisine to that of the camp may affect the health and well-being of the party.

The hackneyed slogan of camp outfitting—to carry just that weight and bulk in outfit which transportation facilities permit—must be reiterated emphatically in our present consideration. The food selected should be suitable for healthful sustenance on an average camping trip. A man can exist on a very monotonous diet of two or three elemental foods, but it is advisable to vary the kind of food taken.

Figure the ration list on a basis of the amount needed for one man one week; then when your party is to be out for several weeks, the computation is easy. If you can secure supplies along the route, reduce the initial amount taken. Fresh fish or game found en route will also help, but do not depend too much on these.

We have appended herewith a list of foods as advised by several prominent authorities and it will serve as our basis for analysis. For each week about twenty pounds are needed per man. Nothing should be con-

COOKING IN CAMP

1. The shelter cloth provides the simplest bed cover and has other uses as a pack cloth or poncho.
2. One versed in woodcraft fashions a fireplace from Nature's stores close at hand.
3. For quickly made bread the old-fashioned bannock is surpassingly good.

CAMP STOVES

1. The gasolene pressure stove is the choice of most campers.
2. The folding camp grate with baker is for the cook who likes an open fire.

sidered primarily except those foods easily procurable at any grocery. Here, then, we draw the line on evaporated foods, although they are ideal for lightweight packs.

The following are looked upon as essentials in diet lists: Flour, bacon, beans, tea, and sugar. They represent the three classes of food necessary for health. For increasing the palatability of the diet other items creep in, and if they represent in food value and concentration of bulk the same as a given amount of the essential food for which they were substituted, they are admissible.

The flour ration should be made up of whole-wheat or graham flour, and yellow corn meal. Bacon is the great standby in the meat line and it can be varied with small portions of ham and chipped dried beef. Beans and bacon together form a well-balanced ration. Beans can be cooked and then baked until all the moisture is gone and only a crumbling crust remains, packed into bags, and later used as a soup or a gruel. As beans are hard to boil in a high altitude, one can prepare them in lower regions by parboiling them without salt in the water, drying them well, and later cooking them as usual in salted water. If available, a steam pressure cooker is ideal for high-altitude cookery.

For a stimulating beverage coffee is usually preferred in the United States and tea in Canada. The latter is much easier to transport and more sustaining to the body. Coffee pots can be entirely eliminated from the camp outfit, if so desired. Choose the powdered or instant soluble kind of coffee, add a teaspoonful to the cup of hot water heated directly over the camp

fire, stir, add sugar, and drink. Get the tea tabloids, which are compact and far better for the pack than loose tea leaves. They are marketed in handy tins. Throw one into a cup of boiling water and a satisfying infusion is the result—the tea settlings going to the bottom of the cup. Tea in general is to be preferred, for a pound of it will go as far as many pounds of coffee.

Don't try to economize in the weight of sugar by substituting saxin or saccharine. True, the latter is sweeter by several hundred times than sugar, but it does not furnish heat and energy such as real sugar does, and that is what is needed on the long trail. Furthermore, saxin long used delays digestion. So, carry sugar, and in winter much more will be needed than is indicated on the check list. Salt and pepper in small amounts as condiments are standard.

Baking powder should be pure, Price's or Royal preferred, and it should be kept in air-tight and water-tight containers. I keep it in a metal flask with a cork-lined, metal screw top. When moisture reaches baking powder a chemical change takes place destroying its leavening power and it is useless for cooking purposes. Keep this in mind in considering self-rising flours which have the baking powder mixed with the flour in proper proportions for use and simply require the addition of water before cooking. So do not take this, for there is danger of the flour getting wet and being thus ruined.

By all means take dried fruit along. Raisins alone constitute a fine emergency food, but for the sake of variety you can take anything you like, as figs, apricots, apples, prunes, etc.

THE CAMP CUISINE

RATION LIST FOR ONE MAN ONE WEEK, WITHOUT GAME	S. E. White, in "The Forest"	S. E. White, in "Camp and Trail"	M. Hunter, Hudson's Bay Co.	A. F. Wallace, in Land Cruising and Prospecting	E. Kreps, in "Camp and Trail Methods"	Townsend Whelen, in game country	Dillon Wallace in "Packing and Portaging"	C. P. Fordyce, average
Wheat flour	7	4	16	5½	6	4	3	5
Corn Meal	....	.....	....	.....	2½	.....	¼	4
Crackers	....	.....	....	¼	.....	.....	.....	....
Bacon	5	4	....	4½	2½	¼	1½	5
Salt Pork	....	.....	8	.....	.....	.....	¼	....
Beans	2	1¾	....	1½	3	1¾	¼	1¾
Peas	....	.....	1	.....	1	.....	.....	....
Tea	.20	*	4 oz.	¼	¼	⅛	⅛	¼
Coffee	....	*	....	1½	.....	.....	¼	....
Cocoa	....	.....	....	.....	.....	.....	⅛	....
Sugar	1½	½	1	.....	1¼	2¾	1¼	1¾
Saxin	....	15otab	....	.....	.....	.....	.....	....
Syrup	....	.....	....	1¾	.....	.....	.....	....
Salt	*	*	4 oz.	⅛	9 oz.	¾	¼	¼
Baking Powder	....	⅛	....	½	4½ oz.	½	⅛	¼
Soda Bicarbonate	....	.....	4 oz.	.....	.....	.....	.....	....
Dried Fruit	1½	¼	....	1	2½	1¼	¼	1
Rice	1½	2	....	.....	.....	1¼	¼	1
Pepper	*	*	....	⅛	¼ oz.	¼ oz.	¼ oz.	*
Emergency ration	....	.....	....	.....	.....	.....	.....	1
Cereal	1	2	....	.....	.....	2½	¼	*
Dried vegetables	....	1	....	.....	.....	.....	1	....
Fresh potatoes	....	.....	....	7½	.....	.....	.....	....
Fresh onions	....	.....	....	1	.....	¼	.....	....
Lard or Crisco	....	.....	....	.....	2½	.....	1⅓	....
Sweet chocolate	....	.....	....	.....	.....	1¼	.....	....
Vinegar	....	.....	....	¼	.....	.....	.....	....
Lemons, fresh	....	.....	....	.....	.....	.....	2	....
Lime juice tablets	....	.....	....	.....	.....	.....	⅛	....
Canned milk	....	.....	....	.....	.....	1	.....	....
Powdered milk	....	.....	....	.....	.....	.....	½	....
Egg, dried	....	.....	....	.....	.....	.....	¼	....
Totals	20	16	27	26	23	16	14½	20

*Refers to rations present in small amounts.

Rice having great sustaining power and not being bulky can be relied upon to replace potatoes, for it furnishes about the same food elements. To cook rice add gradually the washed kernels to furiously boiling salted water and keep over the fire for twenty minutes. So much for the essential foods procurable wherever stores abound.

If available, I would substitute for a portion of the flour ration some evaporated eggs. These have proven a success. A pound represents four dozen of the fresh kind. Useful in omelets, scrambled, or otherwise utilized in cooking. Lard may be omitted and bacon grease used instead. When admissible, butter put up in hermetically sealed tins is good. You can prepare it at home by slowly boiling it and removing the scum as it arises, then cooling and packing in tins with pry-up lids. In camp it is to be kept in springs or streams. In hot countries butter becomes rancid.

Evaporated foods have real value. In the process of manufacture the water is extracted, and then all you have to do is to add water when they are cooked for the table. A real saving in weight is thus possible; for instance, one pound of evaporated potatoes will make seven pounds of the fresh kind when cooked up. These foods are just as nourishing as fresh or canned goods and are ideal for our purpose because of the handiness in transporting and keeping qualities. They are hard to get outside of the cities. Good brands contain no adulterants or preservatives. The following kinds will give satisfaction—julienne, dehydrated onions, potatoes, peas, beans, and soup greens. Milk is conveniently used out of the small tins. Powdered milk

is satisfactory and is the choice when you must cut down weight, as on a forced march.

When on the march our soldiers are supplied with what is known as the "Reserve Ration". This furnishes a most efficient diet for men in active physical exercise and who must prepare their food ofttimes under the simplest and most primitive conditions. This ration must not be confused with the "army garrison ration," which is a suggestive list of food items representing the monetary allowance for each man and by comparison the most generous of any supplied to the armies of the world. It consists of: Bacon, 12 ounces (or canned meat, 16 ounces); hard bread, 16 ounces; coffee, 1.12 ounces; sugar, 2.4 ounces; and salt, 16 ounces. This ration is notable in that all the items are of a nature procurable wherever food supplies can be secured, they are comparatively inexpensive and are a portable supply, of little bulk but yielding much energy. Consisting mainly of fat and starch it furnishes much energy, it does not contain sufficient bulk to satisfy nor build up worn-out tissues of the body, hence commanders are wise to halt the contingent after they have been subjected to the diet for a month, for the purpose of fattening up on a more tissue-building diet with plenty of fruits and vegetables. Each individual is instructed in the preparation of his own meals so as to be prepared for the exigencies of field service when he may become detached from the company commissariat.

In cold weather in the Far North, with probably the means of transportation reduced to a dog team or a back pack, the ration list must be cut down to absolute essentials. To facilitate the handling of the outfit in

the cold, the range of variety had best be limited. The ideal, cold-weather food meeting the above requirements is pemmican. In cold weather the fats should predominate as they do in pemmican, and further, this food keeps well, is very compact, and can be fixed up in a variety of ways palatable to a hungry trail man. Pemmican can be made at home. For a ten-pound lot mix well the following: Ground lean meat, 5 pounds; fat (suet), 4 pounds; dried fruit, ½ pound; and sugar, ½ pound. Hudson Stuck, the conqueror of Mount McKinley, details in the *The Ascent of Denali* how he made his own pemmican: "We made our own pemmican of the choice parts of the juicy meat and never lost appetite for it or failed to enjoy it and assimilate it. The meat was boiled, until well-done, in a fifty-pound lard can. Then it was stripped from the bones and minced and salted and peppered. Some cans of butter having been melted, a mass of this minced meat was rolled in it and then into a ball weighing about a quarter of a pound. We made a couple of hundred of such balls and froze them, and they kept perfectly, even until our outgoing journey. The liquor in which all this meat had been cooked, with the marrow of the bones added, was then boiled down into about five pounds of rich, thick, meat-extract jelly. Four balls of pemmican, two tablespoonfuls of this caribou extract, a package of Erbswurst, and a cupful of rice made the chief ration for the evening meal for the four of us when we were on the higher reaches of the mountain, and we were always well nourished."

On such trips do not rely on baking bread en route, because of the lack of baking conveniences and time.

The moisture in common bread will freeze, so it is best to use the unleavened or sour-dough bread, or the ready-made hardtack or pilot biscuit as the staple. Vary the bread ration with dehydrated vegetables, if possible. Now, if you will add to the Arctic ration the above-enumerated pemmican varied with jerked beef* and hardtack varied with dehydrated vegetables, tea and dried milk, you will have a well-balanced, dry, compact, palatable and energy-yielding diet.

*Jerked beef or venison is prepared best after the method of Hornaday—"Cut meat into strips and work in well: salt, 1 pound; allspice, 1½ tablespoonfuls, and black pepper, 1½ tablespoonfuls. Dry in sun or camp-fire smoke."

CHAPTER VIII

Using the Reflecting Baker

THE more one camps out, the more he accords cooking the first place in contributing to the success of the outing. Nothing will more quickly disorganize the morale of a bunch of good fellows on a wilderness tour than mistreated stomachs. Many men and most women dislike camping because they have to cook with a meagre equipment and under an unhandy environment, the proper utilization of both of which calls forth that peculiar knack which marks the expert camp craftsman. Nowhere else is one blessed with such an appetite as in the active life led in camping, and the knowledge of how to cook right, when it is one's turn to be the culinary artist, becomes a coveted gift.

Most camp cookery is elemental—that is, one must so combine and cook the standard grub list of flour, bacon, beans, salt, sugar, and dried fruit as to yield a palatable, varied, and easily digested diet. The list may now be augmented by the addition of dried milk, eggs, and vegetables, which greatly widen the range of eating variations, and should be included as essentials. The wise vacationist limits his outfit to actual necessities to keep down the weight and bulk to suit his transportation, so he must eliminate as a rule, canned goods, fresh fruits, vegetables, and "store bread".

Just as the grub list must be limited to necessities, so must the cooking utensils be few in number, light in

weight, and of maximum utility. In considerable experience with campers it is surprising to find how few employ that ingenious device known as the Reflecting Baker, and yet were its uses known it would occupy a high place as one of the needed items. The old school of campers stick to the frying pan method of making bread, and they usually fry instead of roast their meats. Where transportation allows, other men use the Dutch Oven—a heavy, cumbersome, iron kettle on legs, made to sit on a bed of coals and having a sunken lid to hold more coals. In the average moving camp a heavy stove capable of cooking as at home is out of the question, so we have been in a quandary as to just what method to use.

Altogether the most satisfactory baker for the camp and trail is the Reflecting Baker. It is extremely portable, being made of aluminum, and folding flat, and capable of producing most excellent breads, biscuits, cakes, pies, cookies (the production of bread-stuffs being a most difficult task with most outdoor men). With it one can prepare fine roasts of the different meats; he can brown potatoes to a turn and bake fish which would be the envy of the most skeptical "chef de eats" of the metropolitan hostelry.

The Reflecting Baker is used with the open fire or next the side of the camp stove. It consists of two flat sheets of bright aluminum attached on one side with the opposite sides flaring and which become, respectively, the top and bottom of the baker—the top slanting like a shed roof upside down. Ends are provided for further retaining the heat, and a baking pan or shelf reposes in the center, where it gets the com-

USING THE REFLECTING BAKER

The sides are made by cutting the third piece of tin, size 12x12, diagonally across, producing two triangular sections, which are both hinged to the bottom piece of the baker. When these are folded to meet the top and hooked, the baker is in proper angle relation to the heat rays from the camp fire to evenly bake the contents of the pan. Near the center of the sides, punch holes at OX for inserting the ends of the wire pan rest.

When ready to use, two small stakes are driven into the ground, and the rear edge of the baker rests thereon. Or a permanent wire stand can be improvised. The bake pan can be made of the remaining square of tin. Its dimensions should be 8x12 inches. The whole affair folds to the thickness of an inch and an area of 12x12 inches. In travel it is best kept in a cloth case.

Baking can be started as soon as the cooking fire is built. The special points about the fire for the reflector are that it must be built high and preferably with a back-log reflector. A low fire burns the lower side of the biscuits before the upper side browns. The open camp fire is preëminently used by campers, and they generally use a wire grate or andirons on which they set their kettles or pans. If such is used, we build a fire on the top of the grate as well as below it. If built as above with any of the following woods, the fire gives a wall of flame two feet high, in front of which we set the baker. Later it will yield a fine set of coals, which are utilized for other cooking. The best woods are hickory, hard maple, oak, and birch. If no grate is used, it is best to build a reflecting back-log of wood sticks, each about two inches in diameter

and two feet long, piled one on top of another, leaning against stakes driven into the ground, or held upright by crotched sticks. The regulation of the heat is done by moving the baker to or from the fire, and by laying a green log on the ground before the top is done. Your baking or roasting will be a success if you know how to handle the heat to enable the top and bottom to reflect the heat evenly above and below and in front and back of the pan holding the dough or meat.

Perhaps the best way to judge a cook's proficiency is by the bread he makes, and no one article of camp equipment was ever invented which has contributed so much to the convenience of the cook and the health and well-being of the vacationist as the Reflecting Baker, which allows not only of properly preparing baking-powder products, but also yeast breads, meats, roasts, and the sour-dough breads which are imperatively used where the temperature is near freezing.

Practically all of the commoner recipes in baking and roasting can be successfully used with a Reflecting Baker, with the exception of beans, whose baking requires a more intense heat than the baker can produce. We must keep in mind that small cakes and biscuits must bake quickly before a hot fire, whereas large loaves, such as johnny cake, must have a slower, more even heat, so as to get done through. The secret of the camp oven is the envelope of hot air, which must not be too hot and must be kept even. The bread supply is the real problem in camp cookery, and for this the Reflecting Baker offers practically all the advantages of the home cook stove, provided we know how to use it. Just as good bread can be baked in camp as in a hotel,

USING THE REFLECTING BAKER

Whole wheat flour bakes easier than white and is more tasty and nutritious. Yellow corn meal surpasses the white, and if using baking powder, stick to the proven Royal or Price's.

BAKING POWDER BREAD

Flour, 1 pint; sugar, 1 tablespoonful; baking powder, 1 heaping teaspoonful; salt, 1 teaspoonful; cold water, 1 cupful. Mix by stirring with a spoon the baking powder, sugar, salt, and flour together; then add water enough to stir the mixture into a thin batter. Pour into a well-greased pan and put into the baker. Never knead this kind of bread. If the dough sticks to a sliver stuck into the bread it is not yet done.

CAMP BISCUITS

For one dozen use the ingredients as given above for baking powder bread, adding ¾ teaspoonful of cold grease, as lard, pork fat, etc., to the mixture. Mix the grease in well so that no lumps remain and no grease sticks to the pan. Enough water is added to make a stiff dough. Now sprinkle the flour on the dough, mixing pan, and hands, and with the roller (may be made out of a sapling) roll out to a ¾-inch thickness. Cut the biscuits with the lid of the baking-powder can and put them into a well-greased bake pan and set before the fire.

ARMY BREAD

This is easy to mix, is made without grease and keeps fresh for a long period, and will not dry up or mold. It is good cold, and is just the thing when laying in a supply for a week. For routine it is the best of the baking-powder products. Take of flour, 1 quart; salt, 1 teaspoonful; sugar, 1 tablespoonful; baking powder, 2 heaping teaspoonfuls. Mix 1½ pints of cold water to make a thick batter and pour out level into the pan. Bake forty-five minutes, or until a sliver will not stick in the dough.

JOHNNY CAKE OR CORN BREAD

Mix corn meal, 1 cup; flour, 1 cup; baking powder, 1 tablespoonful; salt and sugar, each a half teaspoonful; and grease, 1 heaping tablespoonful. If you have it, add ½ tablespoonful of milk or 1 tablespoonful of milk powder into enough water for a thick batter, pour into a greased bake tin. A tablespoonful of egg powder is also a good addition to this bread.

CORN PONE

This can be mixed up before starting so that all that is needed is to add water. It must be kept tightly sealed from moisture

when traveling. Take of yellow corn meal, 1 quart; white flour, 1 pint; sugar, ½ cup; salt, 1 teaspoonful; and baking powder, 4 teaspoonfuls. In camp add sufficient water to make a heavy batter and allow to stand a few minutes. The water causes the baking powder to give off gas and so lighten the dough. Drop the batter in big teaspoonfuls on a hot, greased pan and bake. By using less water and getting a thicker batter you can turn all into a pan and bake and you will have a very acceptable johnny cake. Yeast bread dough can be raised by setting in a pan of warm water. One cook I know of, on a pack-horse trip poured the dough into a paraffined muslin bag and slung it over the pack saddle and it was ready to bake when he reached camp.

SOUR DOUGH BREAD

In cold climates like Alaska, the sour dough bread is mostly used because it rises at near a freezing temperature, while yeast will not, and it is a welcome change from baking-powder bread which, when continually used, upsets the stomach. The method is simple, and since using this kind of bread I prefer it to all others for winter and summer camp trips. A very excellent discussion of sour-dough breads and reflector baking is contained in Mrs. Pinkerton's *Woodcraft for Women*. She prepares the "sourings" by stirring together two cups of flour, two tablespoonfuls of sugar, and one of salt in sufficient water to make a creamy batter. She then stirs in a tablespoonful of vinegar and sets near a fire or in the sun to sour for two days. She says:

"For each loaf of bread use one cup of 'sourings', one teaspoonful of sugar, half a teaspoonful of lard, one large teaspoonful of salt, and a quarter of a teaspoonful of soda, the last two dissolved in hot water. The procedure from this stage depends upon the amount of time at your disposal and your ambition. If you wish to break camp in the morning, make a ball at night, divide into loaves, allow them to rise overnight, and bake at breakfast time. If, however, you are to remain in camp the next day or even make a late start you can improve the bread by allowing it to rise twice, once over night in a ball, and again after it has been formed into loaves. Bread should be baked an hour. In the first half-hour, the baker should be eighteen inches from the fire; the last half-hour, it should be nearer, that the bread may brown. If the bread, when baked, is grayish, you have used too much soda. The amount of soda must be varied with the sourness of the yeast."

RAISIN BREAD

Raisin bread is a baking-powder bread which can be made in a loaf, keeps fresh, and is best when cold. Beat together one cup of sugar and one egg or its equivalent in egg powder. If neither

is available, the egg can be omitted. Add to this two cups of sweet milk, one teaspoonful of salt, two cups of graham flour, four level teaspoonfuls of baking powder, and one cup of seeded, chopped raisins. Let stand in the loaf twenty minutes, and then bake only moderately at first until it has risen, and then move closer to the fire to brown. The substitution of nuts for raisins in this bread makes it even more delicious.

BROWN BREAD

A brown bread which is good either warm or cold can be made with soda and comes as a most welcome change after much baking powder. The use of soda demands an acid. This variety of raising powder is made possible by the addition of a teaspoonful of vinegar or lemon juice to a cup of evaporated milk. The acetic or citric acids will act as a good substitute for the lactic acid of sour milk. Mrs. Pinkerton states that this discovery opened for her wonderful possibilities in the making of camp breads, muffins, and pancakes. Her directions for the brown bread are to stir together ¼ cup of molasses and ¾ of a cup of brown sugar. This can be varied by using no molasses and a half-cup of white sugar. Add to this two cups of milk in which two teaspoonfuls of vinegar or lemon juice have been stirred, two and a half cups of graham flour, one cup of white flour, one teaspoonful of salt, and one teaspoonful of soda dissolved in a little warm water. It should be the consistency of a soft dough. Bake for two hours in a very slow heat. Soda and acid baking require more time and much more moderate heat than the baking powder and sweet milk variety.

CAMP PIE

The fruits should be prepared before beginning the paste for the pie crust, and the stewed fruits are excellent substitutes for the fresh. In making a pie crust handle it as little as possible, make it quickly, and keep the hands and all ingredients cool. Use a cupful of flour, a half-teaspoonful of salt, and with a knife cut into the flour a half-cup of cold lard to the size of peas. Add four tablespoonfuls of cold water and stir with a spoon. If more water is needed, sprinkle in a few drops, but not as much as a tablespoonful. Divide this paste into two parts, roll out one part and fit into the baker tin. Roll out the other half one-eighth of an inch thick, dot it with a tablespoonful of butter, dredge it lightly with flour, fold into the smallest compass possible, beat with a rolling pin, and roll out once, pressing the rolling pin this way and that during the process. Slash with a knife in any desired pattern, lay it upon the fruit which reposes on the under-crust and pinch the edges together. Bake in a hot oven three-quarters of an hour.

CAMP CAKE AND COOKIES

For cakes we cream together one cup of lard and two cups of sugar, add a cup of water, stir in sufficient flour to which has been added a pinch of salt and two rounded teaspoonfuls of baking powder to make a cake dough. This is seasoned with any spice or extract. This should be baked in moderate heat and allowed to rise before it is browned. The same mixture is made into cookies by using sufficient flour to make a dough which can be rolled out. Cut with the top of a baking-powder tin.

ROAST MEAT

Meat for the reflecting baker must first be seared in a fry pan so as to retain the juices. To supply enough grease for basting a roast, we pin thin slices of bacon or pork over the meats and set it in the baker pan which contains water; set it before the fire, frequently pouring with a spoon the juices which lie in the pan over the meat to prevent its drying. These drippings later make excellent gravy by mixing smoothly with flour with the pan partly over the fire and then pouring in slowly a mixture of milk and water, and allowing it to heat to the point where the bubbles begin to rise. The consistency is governed by the amount of liquid added. Before removing from the fire, salt to taste.

ROAST FISH

There is no better way to prepare fish, with the possible exception of planking it than by roasting it in a reflector. The fire should be as for biscuits. In preparing the fish, it is drawn, the scales or skin left on and evaporated, or fresh onions are put inside to modify the fishy taste. To keep it from drying, we cover the surface slightly with butter drippings, bacon grease, or lard, and put morsels of grease in the pan. We never allow the grease supply to fall short and keep basting the fish and adjusting the baker in relation to the fire to a nicety so as not to overheat.

Apparently our best cooks follow no set recipes but instinctively know what proportions to use, but the tyro will follow the directions to a letter for assured results. The Reflecting Baker being of such supreme utility will many times over repay for its place in an outfit and will endear itself in the esteem of the outdoorsman who prides himself on being a connoisseur in wilderness cuisines.

CHAPTER IX

Tents and How to Use Them

To get real knowledge of life in the wilderness when the Red Gods call you, get just as far away from the de luxe, sophisticated, fashionable resort hostelry as you can and live primitively in a tent. Close contact with Nature instills in you the real woodsman's feeling-out where you get full of the ozone and spicy perfumes of the timbered stretches, where you learn what weather really is. Being an open-air dweller should not be a hardship. It does not mean that you must "rough it", for with the proper outfit you can "smooth it", this accomplishment depending upon the degree of wisdom you display in the selection and use of your outfit. One learns from experience what essentials mean, and one provides these units in keeping with the hackneyed slogan of outfitting "to adapt the equipment to means of transportation and to the character of the country to be visited and the purpose and length of the trip." The weight, bulk, and portability of one unit—the tent—will be a decided factor in the feasibility of the trip, for the greater the mobility of one's outfit, the greater is the travel range. It is a far cry, for instance, from the pup tent of the soldier to the elaborate canvas house of a permanent summer colony; but both mean comfort and protection in ratio to the exigent demands of the purpose which governs their use. Much thought and time have been expended to protect men from the

elements. Tents are among the earliest of human habitations, and from the many types we can well choose one which suffices our needs, be it for the permanent camp, for the motor tour, the hunting trip via pack-train, for the canoe cruise, or touring the wilderness afoot. The weight of your tent will be limited according to the means of transportation. The type of cloth house you may use is governed by the use you are to exact from it, and your judgment will be called upon to pick one from the multitudinous and confusing array which their originators have advised to produce something approaching the Ideal. Our tent must answer certain standard qualifications. It must be big enough to house its intended occupants, and light enough and so compact as to be transported easily for the trip planned; it must provide shelter from rain and wind and protection from insects and other wilderness pests; the shifting camp demands a very light tent which one can set up quickly and take down, and for the permanent camp one which is durable and once up "stays put". Tent choice is so inexorably governed by the above rules that individual preferences are within narrow limitations. The permanent camp permits the use of heavy, strong, bulky tents with home comforts when a man is loose and carefree. There are many kinds of forest homes now in use, and the standard tents have been developed in accord with modern requirements; yet it is a matter of fact that civilized man has not improved greatly on the outdoor domicile of the nomad. The Indian with his teepee introduced the up and down lines in tent building, and the European invaders of the new world gave us the horizontal line

TYPES OF TENTS

The Mosquito pest is ever present and will mar the outing unless means to prevent the nuisance are provided: this may be a closed tent with windows covered with cheese cloth, or a cloth-covered frame over each individual bed.

TYPES OF TENTS

1. The Amazon Tent.
2. Mosquito net and frame on cot.
3. The wall tent is the ideal for permanent camps as in this U. S. Geol. Survey camp.
4. Tarpaulin tent.
5. Diagram of tarpaulin tent.

idea—and now we have a vast number of variations and complications of these two. In basic principles we find that all tents use one or more of the three types of roofs—the wedge, the pyramid, or the cone—and of the two types of sides—the slanting and perpendicular. Elucidation concerning the commoner combinations of these sides and roofs will be welcome to the tyro who is in a quandary as to what tent will suffice his needs.

The Lean-to.—A 7x9-foot sheet of balloon silk, weighing two and a half pounds, pegged down along one side with the opposite side raised to a forty-degree angle held by poles and a light rope, is the utmost in shelter simplicity. When you close the ends with brush and build a fire in front of it, it is ideal as far as warmth is concerned. About camp or on the trail it can be further utilized as a general utility tarpaulin. The lean-to is good for short trips in moderate weather and even in cool weather with the backlog fire throwing heat to the angled roof which, in turn, deflects the rays down to the floor. A fire in the woods is generally needed to dispel the humidity. A favorite hunting camp is composed of two lean-tos with top ridges joining, forming a wedge-style shelter. You can buy the lean-to with end flaps.

The Tarpaulin Tent.—This is similar to the lean-to sheet, but more pretentious in size and can be utilized in a remarkable number of ways. It is a simple sheet 10x14 feet, weighing in balloon silk seven and one-quarter pounds, which can be erected as a lean-to or in the shape of a pyramid or miner's tent with flat front giving a floor space of 7x7x7 feet. The sheet is reinforced with tapes sewed along the lines of strain from

the tent pegs to the point of support above. The tarpaulin tent inherits various salient features of worthy forebears—the teepee's peak, the roof angle of the "A" tent and pyramid and its front are a suggestion of the wall tent, while the open camp feature reminds us of the lean-to. When closed it is very snug, shedding rain well on account of the steep tapering roof, and it pegs down fast for a hard blow. It needs but one pole for pitching, or in timber you can simply throw the suspension rope from the peak over an outstanding tree limb. The tarpaulin tent is the most versatile of camp shelters.

The "A" or Wedge Tent.—Among a party numbering over one hundred people on a recent mountaineering trip, a topic of most interesting discussion was "tents", and almost every variety was in evidence scattered over the rocky landscape—from the time-honored wall tent of the commissary department to the one-night-stand bivouac shelter of the experienced hiker. Of particular interest was a simple "A" or wedge tent which had been used for fourteen summers by a certain college professor and an eminent attorney. This tent furnished roomy sleeping quarters for the two, with storage space for equipment items, and also adequate head room above. The walls, really the roof in this tent, needed no guy ropes, as they were simply pegged to the ground and staunch against a hard wind. The wedge was pitched between two trees by tightly stretching a rope ridge, and the tautness was further augmented by an alpinestock wedged under the ridge rope at either end. I rather prefer putting this tent up with a pole ridge above the tent and suspending the latter to it by

tie tapes at each seam and supporting the pole by shears at either end of the tent or tied up between trees. Being easily shifted, this four-walled tent of balloon silk is very desirable for a hunting or fishing trip where transportation is available and quick stops are in order. The wedge tent is an advantage over the wall tent in its lightness, but it can be made into a wall tent by sewing on the wall around the bottom and providing guy ropes. Stewart Edward White, in his *Camp and Trail*, recommends this tent as the camper's standby. As a protection against mosquitoes, he makes a second tent of cheesecloth without any door opening which he suspends by tapes on the inside of the cloth tent. He gets a lean-to effect in the wedge tent by pulling up the loops of the tent to the same stakes that hold down the other wall. The "A" tent is light, cheap, and particularly easy to erect on uneven ground. A good size for two men is 7x7x7 feet, which would weigh, in balloon silk, eight and one-half pounds. The Hudson's Bay tent is but a modified wedge tent with rounded ends and a short ridge.

The Wall Tent.—A wall tent is simply a strip below a wedge tent as the "wall". Although this tent is the accepted type for the permanent camp or Chautauqua colony, it is not very desirable for the shifting wilderness home. It is clumsy to transport, is hard to pitch with its innumerable ropes, poles, pegs and guys, and is blown over easily. It is hot in summer, and requires a stove for heating in winter, and at any season it is most difficult to ventilate. To obviate this last difficulty, specify that the wall tent be provided with cheesecloth windows over a six-inch square cut out of

either end, and protect this opening against storm with a little roller flap of the tent material. This beats raising the wall for air and letting in draughts and insects. Where transportation facilities permit of its use, such as wagon, auto, or pack horse, it is the accepted general utility tent. So much work is required in pitching that it is only practical for the base or permanent camp of several weeks' duration. It is the choice of lumbermen and trappers, for with a stove and brush or snow protection, it defies cold better than the teepee or Sibley. It is usually made of twenty-nine-inch duck, and a fly is often used. The fly is unnecessary in this day of waterproof duck and balloon silk, but if used, it should be pitched over a separate ridge pole above the tent ridge, thus allowing a better circulation of air. The fly is to be recommended for tropical use, in which case it reaches to the ground on either side keeping off sun-glare, allowing ingress and egress of air and storage space for luggage. A tent without fly made of waterproofed duck or balloon silk weighs little in comparison—the fly weighs about half as much as the tent itself—it is less bulky and will not mildew. The eaves should extend out enough to carry water drip free from the walls. A wall tent is a great saving in tent fabric, and for its weight it gives the maximum available space inside. For four people a good size is 14x14-foot floor with four-foot walls and nine-foot center, and this weighs in ten-ounce army duck about fifty-eight pounds, and half that weight in balloon silk. When buying, don't consider floor space alone, for it may be a "low" tent. This size will provide cot room, if the cots are placed lengthwise of the tent,

two on a side. For two persons, a tent the size of 8¾x8¾ floor space, with a three-foot wall, and seven and one-half feet high in the center, is good and weighs, in the army duck, thirty pounds, and in balloon silk, fourteen and three-quarter pounds. The wall tent may be provided with folding or telescoping poles, but in timbered country shears should be made at either end to support a sapling ridge pole above tent ridge which is attached by means of tie tapes.

The Baker Tent.—The Baker or shed tent is half a wall tent, only deeper and with an awning which is available for opening horizontally or closing the tent front. It is very popular with all sportsmen, for it provides much head room in front where the greater width is available, and being deep it has a large sleeping capacity. The awning extension is popular, and with the closed door flap, privacy is safeguarded. When used as an open-faced tent with a backlog fire five feet in front, the tent roof reflects the heat down and warms the interior. The heating principle is that of the hearth fire of our forefathers, utilizing the angles to reflect the heat from the fire down, and is the same idea as utilized in the Reflecting Baker oven in cooking. The Baker can be used with a cheesecloth front when mosquitoes infest, or this can be thrown aside to get the whole good of the blazing camp fire. The 7x7x7 size with a two-and-one-half-foot wall weighs, in balloon silk, thirteen pounds, and is about right for two men.

The Amazon Tent is a Baker with the addition of a front wall fitted below the porch flap and along the front sides. If this front curtain be attached by snap buttons or tape ties to the top, it can be opened out to

the edges of the front flap and increase the depth one-half. This type is the preferable shelter for auto camping, some makers modifying it by building the bed as an integral part of the tent. It can be pitched independently of the auto, or with the back wall attached to the mud guards and top bows, or again by facing the auto with its front flap tied to the top, affording the dining space between the tent and the car and thereby rendering the supply contents of the tonneau easily accessible. In setting up in timbered country, both the Baker and Amazon tents may well have a frame of saplings or we can tie the ridge tapes to a cross rail suspended between trees.

Forester Tent.—The best tent to protect the occupants from draughts and one which is the acme of coziness on account of the reflecting fire reaching to all parts of the interior is the forester tent designed by Warren H. Miller. It is a combination of the pyramid roof and slanting sides. Attached to the front edges is a hood, which can be laced up at night. It prevents rain from driving in. It does not reach clear to the ground, and this low opening allows heat to come in, and such a peak holds the heat within. The front can be covered with cheesecloth to bar out mosquitoes. It covers a triangular floor space of seven feet and eight inches and weighs, in balloon silk, six pounds. It can be set up in five minutes with shears of two ten-foot poles supporting a pole twelve feet long making a tripod. Every user of this tent is well satisfied with it, and manufacturers should accord Mr. Miller due credit for devising a clever arrangement for comfortable camp life.

The Miner Tent.—This is a real pyramid, sometimes provided with a wall, in which case it becomes a "walled miner". Peary used this type of tent in some of his famous Polar dashes. It is quite like a teepee in shape, but gives more available ground space than the conical tent. In pitching, one simply pegs down the bottom and erects the center pole or shears, inside or outside, hence it is especially indicated for use where poles are unattainable in open country such as along coasts, cold northern steepes, on the desert, the plains, or above timberline. Particularly if fitted with a ground cloth, it can be used in country so rough that no other tent can be erected. The miner is a sleeping shelter for the shifting camp, hence there is no need to carry around a lot of head room, which is not to be used as in a wall tent. The same amount of cloth put into a single-pole tent provides a taller and larger house, with plenty of room in the middle where you will need it. It is very stable in the wind, sheds rain well, due to the slope of the roof, and is easy to trench. Two or three persons can be accommodated in a 7x7x7-foot pyramid, which weighs in army duck, fourteen pounds, and in balloon silk, seven pounds.

The Indian Teepee.—The typical Indian tent with its various cognomens—"teepee," "lodge," and "wigwam"—is described as a cone-shaped skin or cloth shell supported by a many-poled framework, permitting the use of an open fire within which diffusible products of combustion gain ample exit through an opening in the peak. The principal objections to it are that it is apt to smoke its occupants out into the cruel, cold world, and too many poles are required to pitch it.

In the proper construction and manipulation of such a tent lies the secret of successful use, and I am not so sure but that most of the failures with this shelter may be traced to improper pitching and control of the air currents for draught. Once you get the theory of the thing, the objections vanish. As already noted, the peak is open, and a wind hood is affixed so that it closes the top opening on the windward side to allow the outside air to enter. That it may not go directly upon the fire and bed, we provide a wind wall whose lower edge is confined to the ground around the edge of the tent like a sod cloth and which extends upward one-third of the way to the peak, where it is suspended by tape ties. Thus the draught principle is much like that of a common kitchen stove, where we open the ash-pan door to let in fresh air, which then rushes upward as a draught to the outlet flue.

The Sibley Tent is a cone much like the teepee, eliminating, however, all poles except one center upright, which rests on an iron tripod over the fire. A ventilating hole is left at the top surmounted by a hood or cap. The large cone tents represent much waste of cloth and space. They are, no doubt, the best; in fact, the only tents where an open fire is used, in which you have a decided advantage in being able to sit cozily at your fireside and feel a certain independency of inclement weather.

The Campac Tent has many advantages, not the least of which is that it can be pitched without poles. Materials.—Before the advent of balloon silk, cotton duck was the preëminent fabric used in tent manufacture. It stands wear and sheds rain well if taut,

closely woven, pitched at the proper angle, and nothing touches it from the inside, for even a finger touch will start a leak by capillary attraction. Where you must have a tent that will get hard wear, choose duck or canvas, but have it waterproof. Unless you are particular to specify the grade, you will get a coarse, loosely woven cloth. It is good only for cheap tents and is at best a poor buy, for it is weak and cannot be depended upon to shed water. One should always ask for samples of cloths before buying. The double filling duck is of closer texture with a better cotton fiber and equal to all but the hardest service and quite acceptable for the ordinary requirements of camp life. Both the single and double filling duck run in twenty-nine-inch widths. Since the strength depends upon the weight per square yard, see to it that twenty-nine-inch stuff is used. Thirty-six-inch material is one-fourth lighter per yard than twenty-nine-inch cloth. Army duck is the best grade used in tents. It is made from selected cotton used in both warp and filling, double-twisted and closely woven. It outwears all others of the same weight—it is twenty-eight and one-half inches wide—and on account of its close weave it sheds water well.

Waterproof balloon silk is a boon to the camper, and its advent has revolutionized tent making and using, and it has made possible an efficient shelter without the necessity of having to lug around a many-pound canvas affair. Probably this one item alone is more largely responsible than anything else in the increasing popularity of knapsack trips. The ingenious woodcrafter, in studying out the short cuts and simple ruses

to get utility in maximum quantity out of a minimum of outfit, has been able to find out that balloon silk has many other uses than that of tent making, and the fabric should be credited with being indispensable wherever campers congregate to solve the problems of light-weight outfitting.

In reality balloon silk, so-called, is not a silk at all but a very closely woven cotton. It does not absorb moisture when treated to the waterproofing process; it is exceedingly durable; is rot-proof and in every way desirable for the purpose for which it was designed. There are lighter tent cloths made, but balloon silk is the choice of the majority. It is sold in a trio of colors —white, which proves to be the most ideally water repellent; green, which is restful to the eyes and is comparatively inconspicuous, modifies the sun's glare, blends pleasantly with the surroundings, does not attract unwelcome visitors—from hoboes to mosquitoes —is shadow-proof when the tent is lighted from within, and does not advertise the earmarks of usage; and khaki-leaf brown, which is popular and has the good points of the green.

Waterproofing.—The particular advantage in waterproofing tent cloths is to keep the tent interior dry and to prevent the shrinkage of the fabric. A waterproofed wall tent needs no additional fly, thus there is a saving in weight and bulk. There is no urgency about drying out such a tent, and if rolled up damp it will not mildew. Kephart states that manufacturers do processing of their tent cloths by one of the following methods: (a) The cloth is filled with paraffin or wax, either enveloping the fibers or ironing

the wax to fill the interstices between the fibers also; (b) chemically treating the fibers, allowing the spaces between the fibers to be open; (c) cravenetting the yarn before it is woven into the cloth; (d) waterproofing the cloth with cupro-ammonium solution and then lightly waxing, which produces a waterproof and slow burning fabric. Linseed or other drying oils are not satisfactory in processing tent cloths. Cloth, unless especially treated, will start to leak upon touching the roof during a rain. Processing a tent to make it water repellent will avail little, if the right cloth is not used in the first place. Any cloth which shows pinholes large enough to let light through when held up for testing will surely leak.

Keeping Out Insects.—One of the desiderata in tent choosing is that it be insect-proof. This is particularly important in regions like Alaska. Railway engineers of that country are sometimes forced to have a tent with floor sewed in and without a door, entrance being through a round hole with a bag sewed around it, through which the camper crawls and ties the bag up after him. Such a tent has cheesecloth-covered windows for ventilation. In most tents a cheesecloth front, covering the door space, is all that is needed. This is preferably sewed to the top and sides back of the front flaps and is left voluminous enough at the bottom to be lifted up for the entrance of occupants. Entirely closing the cloth door flaps and providing windows in the front and back of tent for ventilation is another way of beating the mosquito at his game. Stewart Edward White uses a second tent of cheesecloth with no door to it, which he suspends with tapes on the

inside of the cloth tent. Mosquito bar as sold is no good, as it is not of small enough mesh to keep out smaller insect life and is also too frail a fabric. Bobbinet is expensive. Common cheesecloth is much the preferable insect excluder.

A sewed in ground-cloth is desirable in smaller tents. In the larger ones it can be separated and laid to overlap the sod-cloth, but in fixed camps it is a nuisance and is hard to keep clean. If you have no floor in the tent, by all means have a sod-cloth, which is a nine-inch strip of the tent material sewed around the bottom edge of the sides and ends.

In spite of its name, the "sod"-cloth should not be held down with earth, but by placing camp equipment thereon. It effectively keeps out insects, snakes, and draughts, for one should not expect ventilation from the tent's bottom—one should get this from the windows and doorway.

Your dealer will, in all likelihood, supply your tent with poles having a ring or band at the top to keep them from splitting. You can get jointed, telescoping, or collapsible poles, if you go anywhere but in timbered country. We should never take into the woods anything which the woods furnish, so in tent pitching in the timbered regions we make a framework right there. If you do not suspend your tent from a ridge pole supported by end shears of saplings when trees are near at hand, you are not playing the wilderness woodcraft game rightly. The same is true with stakes or tent pegs. If you must carry them, get metal pegs or two-foot-long wooden stakes, which are driven into the ground

diagonally out from the tent and withdrawn in the line they were put in.

A poorly erected tent is a travesty on the worthiness of being called a good woodcraftsman. To protect from wind and rain storms, the cloth house must be put up taut, and if the cloth and guy ropes are waterproofed, they will not swell and shrink, which would otherwise occur with resultant tearing of cloth and pulling out of tent pegs. Of course, you have chosen a site on an open elevated clearing above the surrounding areas to get good drainage. When you trench around the tent, cut straight down just outside the pegs and then cut a slope into this dam. The dirt should not be banked against the tent.

The pitching of a tent should be methodical. First locate the corners, then drive in the corner pegs diagonally from the center. If you are using a wall tent with "store" poles, drag the ridge ahead so that the tent lies flat on one side, insert the ridge pole inside with the spindle holes meeting the grommet rings of the tent ridge. Insert the upright pole spindles one at each end of the ridge pole, then—you handling one upright and your partner the other—you raise them to the verticle and hold fast until the corner pegs are looped with the corner guy ropes, working naturally, first on the windward side. Finish staking out the side guys and then the bottom loops. To "storm-set," provide long guy ropes from the spindle of the rear upright on top of tent down to the corner peg in front. Repeat this from the front spindle to the rear corner peg and duplicate the process on the other side of tent, and your outfit will weather most any old gale.

In timbered country, you have no business bringing in poles. Get some saplings and make shears for the front and back of the tent which are to support a ridge pole to which the tent is attached with tapes. On a wall tent, we can put side bars onto the shear legs at the height of the side wall and tie the guy ropes to them. If inside poles are used you might put up a "guy-frame" to which to tie the guy ropes. Stakes are driven in at either end of the side wall to support a pole running along the top of the side wall to which the guys are secured. If camping on rocky or frozen ground, it is best to use shears for erecting the tent and guy to the rocks or bushes. The shears leave the doorway unobstructed. They do away with the need of carrying poles into the wilderness, and enable one to adjust the tautness of the tent by moving the shear legs outward or inward. Pegs will not hold in sandy or muddy ground, so we put a hole along the ground in front of the pegs on the ropes, or drive an extra stake in the opposite direction to the regular stake, making an inverted letter "V".

It is a fallacy that night air is unhealthy, and as the average tent closes up like a house without windows, one must specify that ventilating devices be provided for one's tent. Windows should be cut at either end and covered with cheesecloth or bobbinet, or there is made a copper-gauze mesh, which can be removed and replaced with celluloid. A roll-up canvas storm flap should be fitted to close this opening when needed in time of storm and can be operated by tapes from the inside of the tent.

A proposed motor trip was delayed until December

with one party and the Amazon tent tried out. The tent space was made quite comfortable by means of a small collapsible stove with small telescopic pipe. A spark arrester within the pipe prevented sparks (tiny coals) from descending on the tent and burning holes in it. A stove pipe hole in the tent's roof must be protected from burning. Tin scrapes in the wind and cuts the tent when packed for transportation. We protected one tent in an emergency by cutting a hole twice the size of the pipe and sewing in a piece of rawhide to overlap it. Then we cut an opening the exact diameter of the small pipe. Tent makers supply asbestos rings, which are noiseless, safe, roll up with the tent, and are covered with a flap when the pipe is not to be used.

You will not get results with the small tent heaters, unless you understand the principles of steady, slow combustion on small draught which makes charcoal. Warren H. Miller drew my attention to this fact—that a tent-stove fire can be made to last all night. You build a small fire in your stove, giving it plenty of air for good combustion, and thus get a bed of hot coals which we want when cooking. At night the stove is loaded with logs, which rest on the bed of live coals and burn just as fast as the small draught permits. The rest of the logs turn to charcoal and burn slowly, which is a process of hours.

CHAPTER X

Tent Making At Home

SHOULD one wish to try tent making at home, one is at once confronted with the choice of materials. Waterproofed balloon silk as a tent fabric stands in a class by itself. Superseding the antiquated heavy duck and flimsy drill cloth, balloon silk has been the chief item in revolutionizing tent making and thereby rendering extended hike trips at all feasible. It is really not a silk at all but a closely woven cotton cloth with a weight of but three and three-fifth ounces per yard. It is rot-, vermin-, and mildew-proof and exceedingly durable. Any large department store can supply you balloon silk, which can be handled on the ordinary sewing machine. Use good linen thread (No. 25), waxed, and for reinforcing use the tapes secured at the ten-cent store. All pieces to be sewn together are overlapped a half-inch and a one-inch hem is made around the edges. All points which are chosen for attachment to the ground pegs (one at each hem) are reinforced with a small square of the tent material and then tape-ties are sewn on, or else grommets inserted, to receive rope ties. Coloring of the unwaterproofed tent is easily done with Diamond Dyes according to the package directions, tan or green being preferable.

The model should first be made out of wrapping paper according to the printed diagram, and measure-

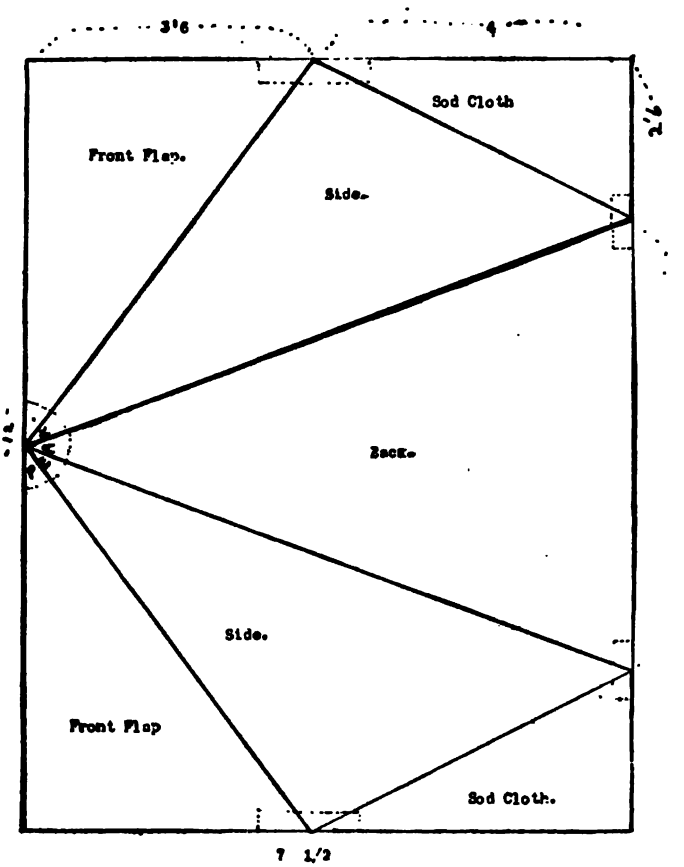
ments are given in inches to represent feet in the finished product. The diagrams supply the areas required upon which we must figure the number of yards needed according to the width of the material needed. Lay the cloth on the floor and pencil-mark the cuttings and reinforcement lines to be made.

There may be used for grommet rings: A. One-half-inch galvanized or brass grommets from the hardware store or tent and awning maker. Cut a hole in the form of an X in the tent goods, insert the ring between the layers of the goods, and sew with a double thread, working around the ring as in making a button hole. B. A three-eighths-inch thimble in the X hole, cutting in the hem, then slipping on the ring and turning over the edge of the thimble with the help of a sailor's fid or a No. 20 spike. This cinches the ring and holds the fabric firmly.

Waterproofing Methods

Unless specially treated, cloth will start to leak upon touching the roof during a rain. Processing a tent to make it waterproof will avail little if the right kind of cloth is not used in the first place. Say you are using muslin of close weave—or the so-called balloon silk. There are several grades on the market, some being so closely woven as to exclude water pretty well without any special waterproofing, while others are of loose weave and soak up water like a sponge and filter the liquid through like a sieve. But the close weave, when treated with the process, will envelope the fibers so they cannot soak up water or let it through, the interstices between the fibers being filled up.

Any cloth which, when held up to the light, allows pinholes of the weave to leak light will surely leak under water also. A satisfactory method of waterproofing is to use preservo or canvasek, or to put a pound of paraffin shavings into sufficient turpentine to liquefy. This is done with heat—by setting the pail in a tub of boiling water away from a fire and stirring well. Paint this over the cloth and hang it up to dry.



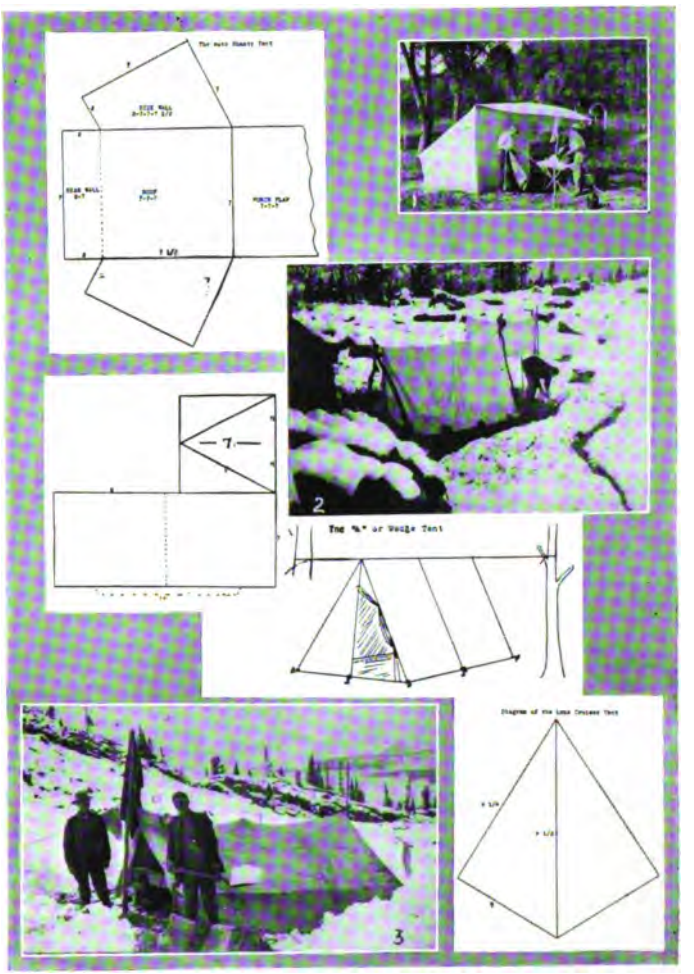
TARPAULIN TENT

CHAPTER XI

Tips on Teepees

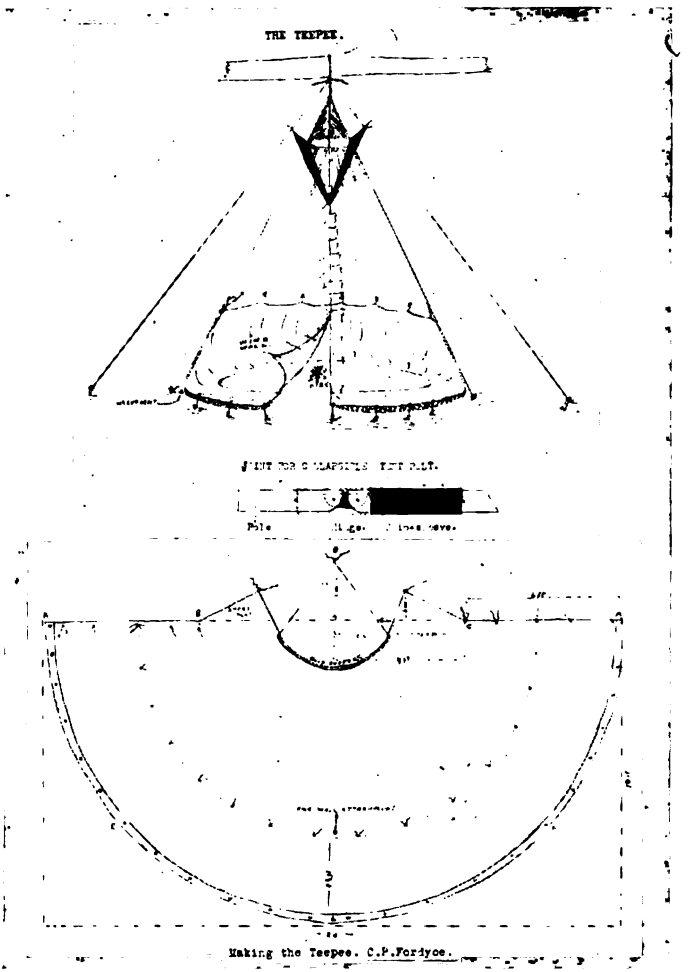
IF one could prevail upon Father Time to set back the clock a sufficient number of years, say to the epoch of the great fur-trading days on the upper Missouri or to the time when Cody hired out to the Union Pacific construction crews to keep them supplied with buffalo meat, we might visit the camps of the plains Indians when they were as yet unspoiled by the "educating" influences of the white man. Forced by primitive necessities they could have been found to have developed a skill in woodcraft which is, by common consent, conceded never to have been surpassed.

Living close to nature, their daily needs were sufficed by the simplest of utensils and, compelled by strong initiative, their handicraft developed to the highest degree of effectiveness. The camper of today can take many lessons in wilderness living from the American Indian. In fact, the farther we get from the ultra-civilization of our modern high-speed life and the deeper we penetrate into the wilderness, the simpler must be the outfit and the greater must be our skill in woodcraft. For three things in particular are we indebted to the ingenuity of the Indian—the canoe, the moccasin, and the teepee tent. We have made multitudinous adaptive improvements on these three in order to more nearly compensate for the needs which modern life now devolve upon us, but the footwear, the boat, and the home of the Redman yet stand alone as



TENTS YOU CAN MAKE AT HOME

1. The Auto Shanty Tent.
2. The "A" or Wedge Tent.
3. The Lone Cruiser Tent.



MAKING THE TEEPEE

products best suited to the primitive uses for which they were intended.

The moccasin is undoubtedly the best footgear for woods wear, and the canoe is still the choice of rivermen on the northern lakes and streams. In spite of many arraignments of the teepee we can still find it in use by hunters and campers who know how to use it properly. It is particularly adapted for the outing which is taken in seasons prone to bad weather, and with modifying improvements is particularly suitable to camping conditions found in a very wide traveling range from the timbered valleys of the mountains to the broad expanse of treeless plains. General utility would seem to be sufficient enough reason for the popular usage of this shelter, but also —who would not enjoy the comfort of an open fire within his outdoor domicile or who would not allow his latent primitive instincts to revel in the picturesqueness of living in a real Indian teepee?

From the standpoint of practicality, as has been intimated, the teepee is under severe arraignment. The modern camper, acting as plaintiff, alleges it guilty on several counts. On the side of defendant for the teepee, which stands as Exhibit A, are retained the services of the reliable guide who speaks with the wisdom of experience. The jury is composed of hard-headed business men who are attired jauntily in smartly tailored outing duds and who for a time wish to change the effete, enervating life of the city for the virile outdoors and want to live therein simply and comfortably, in a teepee—if they are satisfied that it is *the* tent for their need.

The typical Indian tent with its various cognomens—"teepee," "lodge," and "wigwam," is described as "a cone-shaped skin or cloth shell, supported by a many-poled framework, permitting the use of an open fire within, whose diffusible products of combustion gain ample exit through an opening in the peak." The principal objections to it are that it is apt to smoke its occupants out into the cruel, cold world, and that too many poles are required to pitch it.

In the proper construction and manipulation of such a tent lies the secret of successful use, and I am not so sure but that most of the failures with this shelter may be traced to improper pitching and the control of the air currents for draft. Once you get the theory of the thing, the objections vanish. As before noted, the peak is open and a wind hood is affixed so that it closes the top opening on the windward side, thus utilizing the wind as it sweeps by the top to carry away the heated, smoky air of the tent. The lower edge of the teepee cover is staked some three to four inches from the ground on the windward side to allow the outside air to enter. That it may not go directly upon the fire and bed, we provide a wind wall whose lower edge is confined to the ground around the edge of the tent like a sod-cloth and which extends upward one-third of the way to the peak, where it is suspended by tape ties. Thus the draft principle is much like that of a common stove where we open the ash-pan door to let in fresh air —which then rushes upward as a draft to the outlet flue.

The presence of the teepee fire provides comfort in all kinds of weather and is especially appreciated when rain or cold makes ordinary camping a misery. You

manage the smoke by swinging the smoke flaps so the vent is down wind. A clear fire is imperative, and for this only the driest and best woods suffice. A mighty handy contrivance for use in fire-making is the inspirator described by Stewart Edward White, as follows: "It consists of a piece of small rubber tube, two feet or so in length, into one end of which is forced a brass cylinder three or four inches long. The extremity of the brass cylinder is then beaten out so that its opening is flat. To encourage a fire, you simply apply the brass nozzle to the struggling fire and blow steadily through the rubber tube. The result is an effect midway between a pair of bellows and a Bunsen burner."

The old teepees were made of buffalo skins—impervious to weather and spark-proof. One of these old-time lodges is now preserved as a relic of the handicraft of the Blackfeet Indians, in the lobby of the Glacier Park Hotel. As now made these tents are of canvas or balloon silk. Imperatively this cloth must be fire-proof, and this effected by treating the tent to the solution recommended by J. B. Tighe. "Immerse the fabric in a solution of thirty-five grains of ammonium phosphate and seventy-five grains of ammonium chloride to each pint of water. (The size of the tent will, of course, govern the total amount needed.) After soaking the tent well in this solution, hang up to dry." No fear now of burning the cloth and it is waterproof as well.

Opponents of the teepee point to the smoke nuisance as being one of the objectionable features, but this is obviated by the employment of the wind wall. The

other serious objection is that so many poles are needed. In timbered country, poles are easily procured, but this becomes an irksome chore if the camp is moved often. On the plains it is necessary to carry the poles along. Various makeshifts have been evolved to obviate this difficulty. The Sibley tent is much like the teepee, but it eliminates all the poles except the one which rests on an iron tripod placed over the fire. We can simplify this still more by having but a single iron rod next the ground, extending upward three feet and continued to the peak as a wooden pole. The peak attachment is by three ropes from the tip of the pole leading down to a wooden ring (such as a small barrel hoop) which is attached to the tent as an integral part of it. From this ring reinforcing tapes extend down the tent cloth toward the bottom.

One can also pitch a teepee by making a tripod of poles outside and tying the top rope to the apex of the tripod, or one can stick the end on a pole in the ground and lean the other end against a tree and yet have a stable support for the top rope. Instead of poles at all, one can use the top rope fastened to the limb of a tree, the tent bottom being at all times well pegged down on the level piece of ground which has been chosen as a camp site. Whether one uses a single or several poles, it is of utmost importance to have them collapsible. Say you need a six-foot pole—you cut it into two-foot lengths and have a tinsmith make for each joint a snugly fitting galvanized metal tube or ferrule just slightly larger than the diameter of the pole and six inches long. The hinge is simply a piece of galvanized sheet metal made as per diagram with holes in either

end. The two poles to be jointed are sawed longitudinally three inches deep, the metal plate inserted, and nails driven through the wood and holes in the metal and clinched. Fit this hinge with the poles lying side by side, then when they are extended and the slip sleeve is pulled down to cover the break, it becomes a rigid joint. The poles are of hard wood of small diameter (like a broomstick) such as is sold at hardware stores as long handles for fish spearing or window swabbers.

The Indian tent is easily made. You will need twenty-two yards square of OXX muslin or spinnaker duck, fifty feet of three-sixteenths-inch brained cotton rope, a piece of beeswax, some strong twine, sailmaker needles, several rolls of cotton tape a half inch wide for use as reinforcements, and two dozen galvanized iron grommet rings. Sew the material into a piece 20x10 feet and lay it perfectly flat; at the center on one side (a) place a nail and run from it a non-elastic, ten-foot cord. Loop the other end of the cord and with a soft pencil draw a semicircle from (k) to (l) and on to (m). Sew in a two-inch reinforcement strip around the border of the circle, which is to be the base of the tent, and every eight inches puncture the goods and sew in a grommet ring with the waxed thread. These are to be used with the tie ropes to attach the edge of the tent to the ground pegs. The hood and smoke flap are patterned according to the diagram. Cloth tape strips are sewed in for attachment of the wind wall and along the front edges from (k) to (b) and from (o) to (m) for closing the tent floor. The wind wall is a strip of cloth five and a half inches wide

and as long as the outer circumference of the tent; on one side are sewed tapes every twelve inches for suspending from the corresponding tapes on the inside of the outer shell.

In pitching the tent, we lay it on the ground so that the doorway is leeward to the prevailing winds and tie the tapes (k) to (m). This makes a circle. Next we peg down at (k), (l), (e), and (f). Preferably use a single collapsible pole. To its upper end we tie the rope found at the top of the hood and from this point attach two ropes which are to regulate the smoke flaps, being tied to the ropes by their corner tapes. The Indians used poles which fitted into pockets in the corners of the smoke flaps and varied the position of the poles as the wind veered. The ropes are pegged down away from the tent so as to adjust the smoke flaps where we want them. The pole is then raised and the lower end placed in the middle of the circle. Now we finish staking the tent down around the bottom and put up the wind wall, tying its top to the tapes provided one third of the way up from the ground, and tuck the bottom around the base of the tent, leaving space between it and the tent on the windward side and plenty of room at the bottom for the ingress of air. Hold your hand near the top of the tent and you will note the air current shooting upward, which will carry off the smoke and gases of the fire, which can now be built.

The teepee is easily made, and one will, with this style of tent, have a decided advantage in being able to sit cosily at the fire and feel a certain independency of inclement weather.

CHAPTER XII

Utilizing Balloon Silk in Camp

WATERPROOF balloon silk has revolutionized tent making and using. It is a boon to the camper, and it has made possible an efficient shelter without one's having to lug around a man-pound canvas affair. Probably this one item alone is more largely responsible than anything else for the increasing popularity of knapsack trips. The ingenious woodcrafter, in studying out the short cuts and simple ruses to get utility in maximum quantity out of a minimum of outfit, has been able to find out that the balloon silk has many other uses than that of tent making, and the fabric should be credited with being indispensable wherever campers congregate to solve the problems of light outfitting.

In reality balloon silk, so-called, is not a silk at all, but a very closely woven unbleached muslin. It does not absorb moisture when treated to the waterproofing process, it is exceedingly durable, is rot-proof, and in every way desirable for the purposes for which it was designed.

The regulation balloon silk may be purchased already made up in the tent forms one may choose to use, or it may be bought by the yard at the stores of the largest outfitters, or it may be prepared at home by methods which will be detailed later. It is sold in a

trio of colors: green, tan, and white. Green is restful to the eye, is comparatively inconspicuous, modifies the sun glare, and does not beckon the myriads of forest insects to the human feast. Tan or khaki is now in the heyday of popularity, blends with the general color scheme of the autumn woods, is cool, and like the green does not display the trade-marks of usage so much as the white shade. When waterproofed, none of these fabrics increase the original pack weight, if transported after a rainy spell.

One may prepare similar cloth at home by buying unbleached muslin, No. OXX, or Egyptian Sail Cloth, utilizing Diamond Dyes to effect the desired color of green or tan, then waterproofing by the paraffin process, or both waterproofing and fireproofing by the lime and alum bath.

Waterproofing is most satisfactorily done by the following methods:

Paraffin Process.—This one is used by most manufacturers and is most easily accomplished by the novice. Into a tin container is placed one gallon of gasoline and one and one-half pounds of chipped paraffin. The vessel is put out in the sun or other warm place (never near a flame) and when the solution is effected, outdoors, it is spread upon the stretched cloth with a brush or a sponge. The gasoline evaporates, leaving a thin coating of paraffin in the fibers of the cloth.

Lime and Alum Process.—Fireproof cloth is nearly as desirable as waterproof. Many camps have been burned by sparks which have fallen on the tent roof, which has been rendered hot by the heat of the nearby fire or sun. A spark falling on a fireproofed tent leaves.

at most, but a small round hole, and not utter destruction.

The tent is immersed overnight in a solution of four ounces of alum, ten ounces of lime, and ten quarts of water, which has been prepared by mixing and allowing to stand until clear. Only the clear solution is to be used. Rinse in lukewarm water, stretch and dry in the sunshine. The fibers of the cloth are filled with an insoluble lead acetate and alum and it is thus rendered efficiently fire- and water-proof.

These processes only add to the effectiveness of the cloth itself, for the ability of a fabric to shed water depends upon the fineness of the weave, and not upon the weight of the cloth. Balloon silk has a weight of but three and three-fifths ounces per square yard, while waterproofed twelve-ounce duck tips the scales at sixteen ounces.

Food Bags.—Grub compounds of the camp outfit are most conveniently and safely carried in waterproofed balloon silk bags with tie strings near the top. The dimensions of the parts are: A disk, nine inches in diameter, which is to serve as the bottom, and a rectangular section, 10x27 inches. Overlap the edge for a half-inch from D to F, sew to reinforce, and near the middle affix a ten-inch tape to serve as a tie string. To complete the bag, sew A to B, beginning at C, and then the edges D and F.

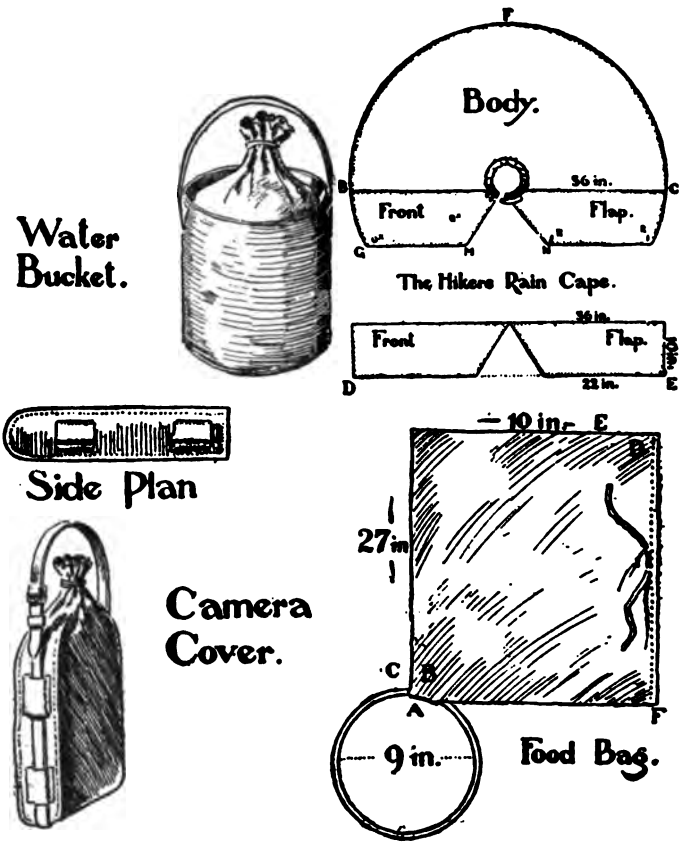
Balloon Silk Bucket.—Take one of the food bags and secure a wooden hoop nine inches in diameter (the hoop used by women in embroidering is the proper thing), and sew into the bag top by overlapping a half-inch. A heavy tape is securely affixed on either side to serve

as a handle or carrier. To prevent water splashing out, it is well to sew in an extra top (B), which consists of a piece of balloon silk twenty-seven inches long and five inches wide, sewed in below the hoop and with a tie string at the top. Such a contrivance will add very little appreciable weight to an already heavy pack, and it is of undoubted value and utility.

The Hiker's Rain Cape.—Nature can in no way mar the pleasure of an outdoor trip so effectively as by rain. Decidedly, it is no fun to hit the trail, make camp, and cook when Pluvius decrees that he will take a hand in your outing. It is bad enough to have to hunt burnable firewood, to have your pack soaked, and to have to seek a night's repose on the soaked bosom of our terrestial sustainer, but wet camps dampen the spirits of the ardent recreationist and effectively destroy that morale which upholds one in overcoming the difficulties incidental to trail life everywhere.

The resourceful woodcrafter employs his unique artifices to replace luxurious appointments of civilized living, and when up against a wet spell the various uses of balloon silk have come to be the greatest kind of a boon. It protects one's camp by the shelter overhead, one's back from moist ground, and if one wishes to travel in a pourdown he can elect to utilize a rain cape which, composed of balloon silk, will render the greatest service, yet encumber the pack by a very little added weight.

The army poncho is in common use, but the rain cape is far better, having all the good points of a poncho, it protects the arms better; it can be slipped



HOMEMADE NECESSARIES FOR THE CAMPER

on over arms and pack and yet leaves the arms free enough and is airy underneath.

You get a piece of the silk thirty-six inches wide and seventy-two inches long for the body of the cape, and lay it on the floor. Get another piece of silk ten inches wide and seventy-two inches long for the front flaps, and sew on a B to C. Before cutting the circle, measure twenty-two inches in from either end of the front flap piece; that is, in from D and E. Now, at the center, put in a nail to floor and stretch from it, by a loop, a string which will extend to F, where another loop is made and pencil used to follow the semicircle around to B–G and C–R. Cut along this line, turn over a half-inch, and hem to reinforce. Draw a straight line from the center A to M and N, and cut. Make a circular opening six inches in diameter at A for the neck, sew in an upright collar one inch high, and on the neck piece sew a strap of double thickness balloon silk with button holes to secure the cape to buttons at Y; provide at XX small buttons and holes for them at RR in the front flaps.

Camera Cover.—Trail dust is capable of working through almost inconceivable openings, and the camera shutter must be protected, or it will gum up and lag and your photos be ruined. On a recent motor trip to the coast from Kansas City, I stopped at the Grand Canyon, where I found my shutter absolutely gummed up with desert alkali dust. A balloon silk cover would have prevented this, for I made one in Portland later and even the fine alkali of eastern Oregon and Idaho failed to work in and affect the working parts. Such a protection slipped over the carrying case kept out dirt

particles and kept the camera dry. I first cut out the sides, which were made one-fourth inch larger than the side of the camera cover and four inches longer; then I sewed in two loops on each side through which later is to be threaded the shoulder straps; next, I cut out in one piece the front and back, which were the same width as the cover, but eight inches longer (four inches for either piece of front or back). The sides were then sewed to the front and back pieces, a piece of one-half-inch tape attached near the top for a tie string, the shoulder straps removed from the regular leather cover and threaded through the cloth loops, and the affair was ready for business, which it did to a perfectly satisfactory degree.

Balloon Silk Pack Sack.—The best pack sack and the simplest was originated and put out by Poirier, of Duluth, over twenty-five years ago, and it was really the white man's improvement on the Indian tump-line and pack cloth, so ingeniously folded and tied as to serve as a sack suspension harness. The shoulder straps have the desirable single point suspension, and the head strap enables the wilderness voyageur to ease up different sets of muscles while on the trail and in handling a load. The combined use of the neck and shoulder muscles are brought into play.

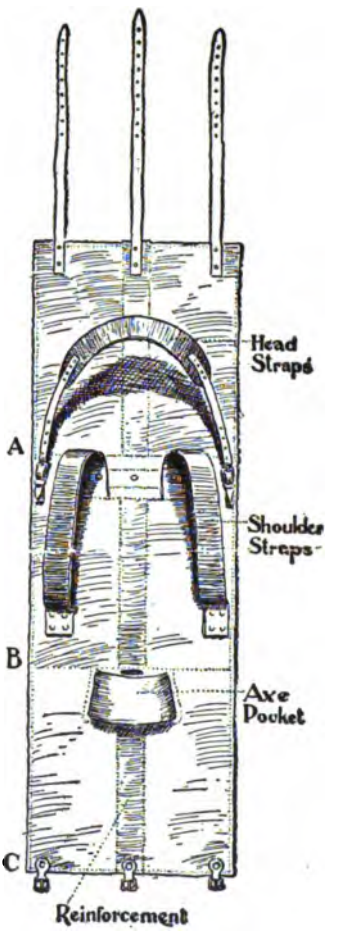
The pack should be carried so that the bulge fits the hollow of the back. As manufactured, it consists of heavy leather straps and double-filled canvas sack. I have made and used to my entire approval a sack made of reinforced balloon silk and a harness of cloth webbing which stands service, is waterproof, is very light in weight, and the harness does not stretch as leather does.

To make, procure a piece of balloon silk 18x54 inches. Reinforce by sewing a double thickness two-inch strip of balloon silk through the middle from one end to the other. Sew in a 4x5 pocket for the axe, with one side open and located next the line A-B; a tape for axe handle security opposite this; two two-foot-long shoulder straps of two-inch-wide furniture webbing; a two-inch-wide head strap of the same material (two feet long), and three small tapes at one end for the closure of sack, and corresponding suspender clasps at the other end for their reception. Now fold the whole sack cloth at A-B, so that C and A coincide, sew together; do similarly on the other side, and the sack is done. The saving in weight in back packing, where every superfluous ounce must be eliminated, will be appreciated; if not now, it will be after hours of real wilderness touring.

The Cruiser Tent.—The most practical tent for lightweight camp outfits where full protection from the elements is needed is one of the cruiser pattern, made of balloon silk and then waterproofed. It has a sewed-in floor, ventilating mosquito-proof window, and it can be pitched with but one pole. It is the popular tent among the mountaineering clubs of our Pacific Coast region, and they can use an Alpenstock for its support. It furnishes full protection for two men camping around snow line, where tents must be put upon uneven ground.

This tent, after thorough test, meets all the requirements of the ideal lightweight shelter. Were it not for the well-placed cheesecloth window, one would be enclosed in an almost air-tight, and certainly

HIKER'S TENT



PACK SACK

water-tight, storm-proof cell. Its shape is such as provides sufficient headroom and the floor is big enough for a double bed. Being so low, it is well braced and weathers severe storms well. The sewed-in floor protects the bed from rain, wind, snakes, insects, and the like. Its single peak makes the simplest form for suspension from an overhanging limb or single pole. It rolls up compactly and is very light. One gets the lean-to advantage of a front fire reflected into the tent and down upon the sleeper by simply throwing open the front flap.

The cruiser tent is made by cutting out the sections as per diagram. The pieces had best be reinforced, as marked at the corners and side, by sewing in a little 3x4-inch square of the tent stuff. A 6x10 window is cut out of the roof about a foot from the center line running from H to G. This is covered with cheese-cloth sewed to the top, and tapes are so placed as to allow of its being rolled up when the window is to be open.

Begin assembling by sewing the small end triangular piece to the roof approximating H to B, K to G, and KI to GC. Then sew in the floor cloth, stitching AB to AA; BB and DC to DD-CC of the floor cloth. The door is then sewn in; FG to HD and EG to EE-DD. Complete the tent by sewing HI of the end to BB-CC of the floor; add a strong tape loop at G and H of the roof; make eight-inch tie strings at A, B, C, D, K, L, and EE; provide several yards of strong tarpon line to lead from G and H for pitching the tent, and your balloon-silk home is ready for the trail.

CHAPTER XIII

Making the Recreation Cabin

No cold weather camp is more comfortable or secure in time of storm than a cabin. Like all implements of the wilderness dweller, this one owes its origin to practicality. The frontiersman, pushing the outskirts of civilization into untrammeled forests with meagre outfits and often with only an axe for a building tool, utilized materials furnished by Nature close at hand. Of all human habitations, this one represents best the character of its builders—their sturdiness, sufficing aptitude in woodcraft, and permanency of purpose.

Ofttimes the sole sign of civilization in a forest primeval, and hewn from trees nearby, the cabin is essentially a product of its environment. The pioneer, unlimited in his fund of resource, wrests a home from the wild places, and he beholds no gladder sight than the welcome red gleams from the cabin window, lighting the pathway along the snowy aisles and bespeaking the warmth, cheer, and hospitality of the roaring flames in the open fireplace of the interior.

The forest itself, as suggested, may furnish all the building materials needed for roof, walls, floor, bed, heat, and light. Perchance the means of transportation or proximity to supply points will enable one to supplement the forest's generous offerings—maybe a roll of tarred roofing paper, a glass window, or a stove.

For the site of the cabin, choose an elevated place sheltered from the northern winds, preferably on the south side of the slope and backed by thick groves of forest growth. It is necessary to be near good drinking water and a dry wood supply. In front, let there be an open exposure to the sunlight and room for an expansive view of river, valley, or forest meadow.

For the trapper, the cabin will be a permanent home and base of supplies and a comfortable camp after making the run of traps—a place where he will be sheltered alike from the elements and forest marauders.

Vary the length of the house according to the length of logs most easily found in the vicinity. The best size one believes to be a 10x12-foot base, with walls seven feet high, as this size can be more easily kept warm than a larger one. Thus there will be needed twelve logs arranged in tiers for each of the sides and ends. Usually one straight tree will furnish two logs, and one will need in all about twenty-five twelve-foot and twenty-five fourteen-foot logs, whose average diameter is from six to eight inches, the extra length allowing for the corner joints. For the roof will be needed seven sixteen-foot logs to be used as beams. Most any kind of timber will do, such as pine, cedar, fir, spruce, and even poplar or aspen will suffice. Many log cabins have been built with simply an axe as the building tool, but the addition of a cross-cut saw and supplies, such as window, hinges, nails, etc., will greatly help.

Level the chosen site for the forest home, clearing off the brush and stumps. Where the corners of the cabin are to rest, imbed flat stones to bear the weight where it will be greatest. Now place two of the twelve-foot

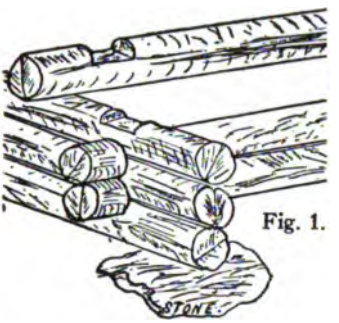


Fig. 1.

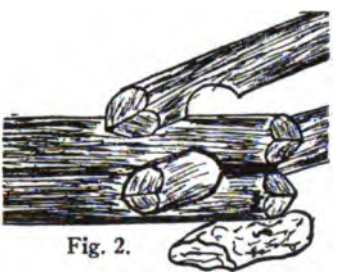


Fig. 2.

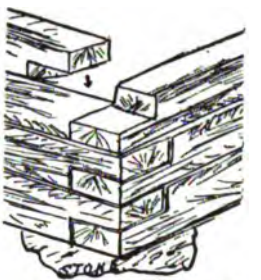


Fig. 3.

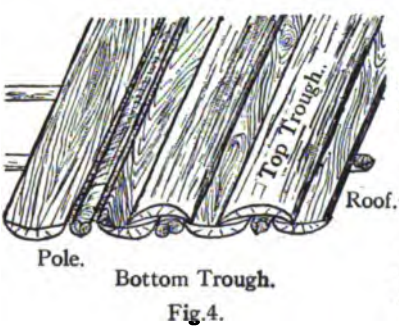


Fig.4.

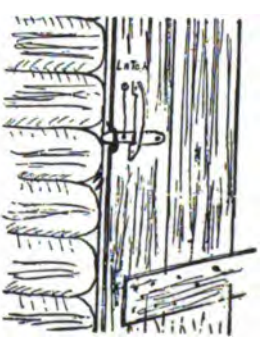


Fig. 5.

foundation logs for the ends at respectively the front and rear of the proposed building. Now, for either side wall place a fourteen-foot log so notched as to fit in with similar notches in the end logs, giving thus a rectangular log foundation. Fig. 1. (p. 123.)

The notches must be carefully made to secure an accurately-fitting mortise joint. For an eight-inch log, notch one-fourth its diameter, or a depth here of two inches is sufficient. Or one can make a notch one-half the diameter of the log on its under side. Fig. 2. When in place, the logs in tiers should meet throughout their entire length, but usually this is impossible because of the inequalities of the surfaces. This, however, can be later remedied by tamping the cracks with mortar. Next, notch and place two more end logs, and then turn two more side logs, and so on, up to the completion of the walls, ending at a height of six or seven feet.

Undoubtedly the notched method of fixing the corners is the oldest and strongest, but there are other ways of making good corners. If available, take two heavy, sawed planks or split logs and nail them together in the form of a V or trough. Fig. 3. Now stand this on end and fit it over the corners of the logs. Make four of these altogether, one spiked to each corner of the bed logs of the cabin, which are laid on the solid rock foundation in a rectangle. To fit the ends of the logs, mortise them by removing from each half, as is shown in Fig. 3. Leave no protruding ends, for there must be an even surface to spike the corner trough to.

As the butt end of each log is of larger diameter than the top end when placed in tiers, these ends must be

alternated, so that upon the base of one log rests the butt end of the next above, so the wall will not be higher at one end than at the other. As the walls grow in height it will be found necessary to use skids composed of logs placed against the top of the wall, and then levers or block and tackle may be employed to raise the logs to their places.

Of course, your cabin is not to be a closed box, hence allow for a door, a window, and a fireplace. When the wall is three feet high, cut out a four-foot portion of the top log of the rear wall and attach the sawed ends by cleats to the whole length log to prevent these ends from buckling. There is now room for the use of a saw as a starter in later opening the wall for the fireplace. Continue the wall upward as before.

In the same way, at a height of three feet and on one side of the cabin, cut out a thirty-inch piece and cleat into place, for here later will be put the window. When the walls reach a height of five feet, cut out of the top log on the front a two-and-one-half-foot space for the door. Fig. 4.

If you are planning to cover the notched corners of the logs with plank trough, it may be well in the beginning to follow an entirely different plan for the openings of the cabin. As soon as the foundation logs are in place, make a door jamb from planks two and one-half by six feet, set into place over the threshold on the bottom log and hold there temporarily with the supports, allowing it to extend up into the air. Now you can utilize short logs to reach from the door frame to the corner trough; these should be spiked into place. Likewise frame up the fireplace opening two feet high

by four feet long on the rear wall, and at a height of three feet set a window frame in one of the side walls. It is well to fashion this frame into a perfect fit around the standard window sash you may have brought in with you. In lieu of glass, use oiled paper or celluloid.

Carry the walls up to a height of about six feet from the foundation and direct your attention next to the building of a weather-proof roof.

The Roof

Two sixteen-foot logs are used as the beams, and they are notched in place with one end protruding in front of the cabin to form a shelter or porch. Two twelve-foot logs are then notched and placed over these. Fig. 4. Now measure twenty inches inward from the sides on the twelve-foot logs and notch them for receiving another pair of notched sixteen-foot logs. Then put on two more end logs (one for each end) and again measure in from the side wall, only this time forty inches, and place there a properly notched sixteen-inch log as before. The log is set into place in the center to serve as the ridge beam of the roof. Draw a line from the ridge beam to the lower roof beam and saw the surplus end logs away. Fig. 4. The roof beams make fine supports for shelves on which to store supplies.

The covering of the roof is to a certain extent a measure of your success in building a cabin which is a perfect shelter. You may have to utilize only materials close at hand, and that may mean a roof of sod or dirt, but with a froe you can make shakes, or rough shingles from the forest, or, if you have a nearby supply point

CABINS

1. A cabin built of native lumber and a fireplace of discarded brick make an ideal wilderness habitat for week-end trips near home.
2. The cabin is essentially a product of its environment: Nature furnishes the materials—Man does the rest.

CHALETS AT TWO MEDICINE CAMP, GLACIER NATIONAL PARK

The Swiss Chalet type of cabin with heavy beams over the roof to protect from heavy winds and to withstand the deep snow-weight on top.

Copyright 1912 by Kiser Photo Co., for Great Northern Railway.

and proper means of transportation, manufactured shingles or tarred roofing paper may be used. During the summer months many cabin builders use the bark of such easy-peeling trees as cedar, spruce, hemlock, or birch. The squares are placed two- or three-ply thick and are nailed down or held with stones.

A great many Western cabins are covered with sod. To do this procure a large number of straight saplings and lay them close together, extending from the ridge beam to the lower roof beam. Lay upon these a matting of grass and boughs, and cover this thickly with dirt or sod. Place logs at the edges of the roof or tack on boards to hold the sod in place, as it becomes weathered and the disintegrating particles seek lower levels.

Of course, a neater and more permanent roof covering can be made with boards or tarred roofing paper. Flat slabs or uniformly straight small poles should be placed alongside and secured to the beams, from the ridge beam downward. On this is tacked shakes or other roofing material. If a wood which is easy to split is nearby, one can make troughs for roofing. Split the logs in half and hollow out a trough on the flat side. Resting on the roof beams, place a trough, hollow side up, and beside this a straight sapling, then another trough and sapling and so on. Moss or clay should now be used to fill the cracks. The eaves should extend over about eighteen inches. Over each sapling place a trough with the hollow side down. Fig. 4. Thus the edge of each trough meets the middle of the two troughs below. A large trough can be set over the roof beam.

If you have not provided a frame for the door, saw

down from the open logs on either side to the threshold, as described, and nail in place a door frame. Remove the cleats. The upper and lower logs are flattened for lintel and sill. Do likewise with the window. Batten together a number of slabs for a door, swing on hinges, so it will open inward, and improvise a latch. Fig. 5.

The better camps will have a floor, because such is much warmer and cleaner. It is not the air low down which makes cold sleeping in a cabin without a floor, but it is the damp ground. Small, straight saplings laid side by side over the ground and tamped with moss, mortar, etc., make a nice floor.

Although you have fitted the logs in the walls closely together, there are many cracks remaining between the logs which must be closed. In the larger ones, pound in strips of wood. Fill the smaller cracks with some kind of mortar which will not become disintegrated by the weather. If the mortar is to be used in making a fireplace, it must withstand fire also.

Any of the following serve as good mortars:

(a) Swamp lime with feathers, moss, or dry grass.
(b) Blue or yellow clay with wet sand.
(c) Clay well mixed with powdered mussel shell.
(d) Put lime in a tight box and slack it by wetting with water. This makes it steam and heat, so you must keep adding water from time to time to keep the lime from burning or slacking dry. If you keep it at about the consistency of thick paint it will be about right. Prepare this lime several days before needed for use. Now take one cask of lime to six bushels of sand and mix well. If you add Portland cement in the proportion of one to two quarts to each pail of mortar, the mixture will be much stronger and will set quicker.

MAKING THE RECREATION CABIN

The Fireplace

The heating of the cabin is best accomplished with an open hearth fire. This style of heating plant is no economizer of fuel, for it carries much of the heat out the chimney, and having but one radiating surface, a large fire is necessary to heat a room. But the joy it affords more than compensates for the lack of economy, for what is more home-like than to sit cosily before an open log fire as the rain patters against the window panes or the roof becomes laden with fresh-fallen snow? The making of a fireplace is a tedious job and the construction must be made on certain mechanical principles so that the flue and the reflecting surfaces are efficient. (See diagram on page 131.)

Build the chimney of flat stones and mortar around the space you have cut out in the rear of the cabin. Fig. 6 shows a portion of the cabin wall and side of the chimney left open to show the interior. In laying the stones, be careful to keep the joints in each layer from coinciding with those in the next layer above and below. The timber A, which arches the hearth, must be heavy to withstand the weight of one side of the chimney above, and must be covered on the exposed surface with mortar to prevent the flames from leaping up and firing it. An iron bar, if available, is really the best.

To secure a proper draft, the throat of the flue opening at B is made narrow (three inches) by building the ledge C inward. This shelf prevents too much air rushing down and it also accelerates the draft upward. The flue passage should represent 10 per cent of the opening of the fireplace, thus the flue dimensions of one foot long by three inches wide will be amply large

for the fireplace opening, the width of which is four feet, depth, two feet, and height, two feet.

The slant of the shelf brackets from C to D is 45 degrees. Necessarily the base of the chimney will be large enough to enclose the ground space which the fireplace occupies within, but after reaching the shelf C and the archlog A, one can reduce the chimney's inside dimensions to a foot square and continue thus to the top. Fashion an iron crane to revolve from a pivot fixed at one side of the fireplace E, and before the burning logs dig a small hole in which the bean pot is to rest over night.

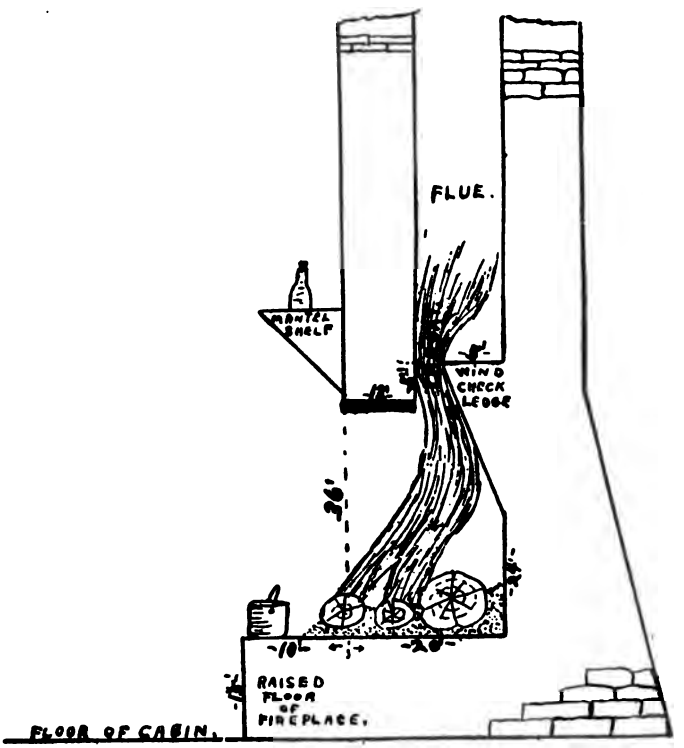


Fig. 6.

DIAGRAM OF CONSTRUCTION OF FIREPLACE

CHAPTER XIV

Taking the Place of the Doctor

A KNOWLEDGE of the various principles of first aid in the efficient treatment of the ailments encountered on the wilderness trail should be taken as a solemn responsibility. Once you come face to face with an accident which endangers the life of yourself or a companion, you will realize how indispensable is this ability to meet the exigencies incidental to active outdoor life—exigencies which force you alone to act, because first aid is generally required where one cannot shift the responsibility by stepping to a telephone and acquiring the assistance of an expert who is trained in all the methods of the healing craft. First aid does not rival the physician, but simply takes his place as an emergency measure. You should meet the responsibility with preparedness as to an understanding of methods and an efficient first-aid kit.

Health risks may present themselves in endless variety, and votaries of the vacation idea will sometime find use for a compact kit of a few remedies and certain surgical indispensables. This security, coupled with an alert disposition to make efficient use of what else lies readiest at hand, will go far toward meeting emergency requirements, and meeting them not alone sympathetically but practically and, to a degree dependent upon previous study and training, scientifically.

Recognizing that accidents occur in spite of all pre-

cautions and that they are usually met with under certain conditions of unpreparedness, the first attention is to decide whether the mishap is obviously serious or delusively trifling, and then to meet the emergency with promptness, cleanliness, and a selection of such curative measures as will safeguard life.

A certain physician of the generation past said that the main rules of good health were to keep the head cool, the feet warm, and the bowels open, and that, if driven to it, he could treat satisfactorily the majority of human ailments with castor oil and a pain reliever. While this is a broad statement, yet most compilers of first-aid outfits err on the side of too much equipment. We will need to take something to be used internally to relieve pain and reduce fever. One type of medicine will do both, so why take several kinds? Of course, we will need a reliable laxative—the kind we have found effective; another tablet will be used for an opposite effect on the bowels as in diarrhœa. We will need a stimulant for quick work as in fainting and shock, and for more sustained effect, as in snake bite. We will want pure water, so include the preparation which the army uses persistently in the field. Certain balms for the skin, a good surgical antiseptic, and sterilized dressings complete essential needs.

Wilderness travel subjects the outfit to the severest wear, hence the kit must be extremely portable, light in weight, and most compact, and yet complete enough to meet average requirements. I am not a slave to any marketed outfit yet devised, but I have faithfully inquired into the needs of first aid as gleaned from members of the outdoor clan. I have endeavored to

meet these needs with the most approved medicaments and methods in vogue which anyone can safely utilize. It is commendable to assemble one's own first-aid kit, and all its units should be replaceable at any drug store. Certain items are particularly adapted to first-aid kits and are well worth specifying.

A tin tackle or bond box answers admirably for the kit. My outfit, with the exception of the First-Aid Wound Packet, which is always with me in my left shirt pocket, reposes in a waterproofed, cardboard, mailing carton or cylinder with a tin screw cap. When this is carefully packed, the few glass vials recommended as tablet containers are not taboo, although tablets may be packed in the large gelatin capsules procurable at the drug stores.

FIRST-AID KIT—CHECK LIST

Tablets, Aspirin, 12.
Tablets, Laxative, 24.
Tablets, Stimulant, 12.
Tablets, Intestinal Antiseptic, 12.
Tablets, Halazone Water Sterilizer, 24.
Tablets, Antiseptic, 12; Marked "Poison".
Vials, Tincture Iodine, 3.
Tablets, Potassium Permanganate, 12.
Tube Analgesic Balm, 1 ounce.
Tube Carbolized Vaseline, 1 ounce.
First Aid Wound Packet.
Cotton, 1 ounce.
Sterilized Gauze, 1 yard.
Bandage, 2 inches by 10 yards.
Z-O Adhesive Plaster, 1 inch by 5 yards.
Forceps, Scissors, Lance, and Safety Pins.

FIRST-AID KIT—DESCRIPTION AND USES

Aspirin.—In tablets of five grains each. A remedy for general pain and fever in headache, colds, rheuma-

tism, lumbago, neuralgia, etc. Take one each hour for three doses, then one every three hours.

Laxative Pills.—Either cascara compound, Hinkles', or phenolax. The bowels should move once a day. Take one or two pills at bedtime.

Aromatic Spirits of Ammonia.—This is the preferred stimulant as used by the army, navy, Red Cross, and by physicians generally, because it is safe, powerful, portable, reliable, and so diffusible that it can be effectively used for inhalation when a person cannot swallow. For our kit, we would specify the kind marketed in sealed glass capsules which is covered with cotton and well packed so that it is little liable to damage. In use the capsule is broken between the fingers and held within half an inch of the nostrils in cases of shock, faintness, sick headaches, etc.

Tablets: Stimulant.—Either caffeine citrate, grain one; monobrated camphor, grain one; or strychnine sulphate, grain one-thirtieth in each tablet. Used principally in snake bite, shock to the system in accidents, etc. Take one every three hours. The caffeine in coffee and tea is a stimulant which is safe and easily procured and much preferable to alcohol.

Tablets: Intestinal Antiseptic.—May be either the aromatic chalk powder, the Intestinal Antiseptic (Abbott), or bismuth subgallate, grains, two and one-half in each tablet, used to control disorders of the intestinal tract. Diarrhœa as well as vomiting may be taken as Nature's effort to rid the system of offending substances, so we should first aid her by giving a laxative, and after it acts, mildly check the bowel actions. Give one tablet every two hours.

Tablets: Halazone.—Used to safeguard the camp's water supply. The simplest method of purifying water is to boil it furiously for an hour. If foreign débris is present, it can be readily removed by filtering, which may consist simply of pouring through absorbent cotton held in a funnel or in the cleansed hand. Halazone is a chemical which is effective even in dilutions of 1 to 500,000. One halazone tablet is added to one quart of contaminated water and in twenty minutes the clear liquid is safe for drinking.

Tablets: Chlorazene Antiseptic.—Common soap, besides being an efficient cleanser, has some antiseptic action and all wounds and the adjacent skin must be thoroughly mopped with soap and a cotton swab. One of the great achievements evolved during the great war was the production of Dakin's Solution—a chlorine-liberating chemical which is not poisonous to tissues, is non-corrosive to tissues, promotes healing, and is an active germicide. In fact, so potent is it that it is fifty times as effective as carbolic acid and many times more active than corrosive sublimate and at the same time free from objectionable features of these products. It is marketed in handy tablets under the name of CHLORAZENE (Abbott Laboratories, Chicago). Its obvious use is in the care of infected or poisoned wounds, and with rational precautions it can be employed wherever antiseptic action is needed. It is used in a 1 per cent solution, which is made by dissolving one tablet in one ounce of water.

Tincture of Iodine.—Used as first-aid treatment of wounds and abrasions, is one of the most valuable and popular of germicides, penetrating particularly well

on the skin. When used repeatedly, it causes the skin to peel off. Iodine is best carried in the form of Trench Tubes, which are glass capsules one end of which tapers and is covered with cotton. In use, the tapered end is broken in the fingers and iodine-soaked cotton is used brush-like directly to swab the wound and surrounding skin. Antiseptic gauze is then applied to the wound and held in place with a bandage or adhesive strips. The sooner after an injury that iodine is used, the better. Iodine kills germs, prevents infection and blood poisoning, and being in a form so ready to use, is the ideal first-aid wound dressing.

Analgesic Balm.—A solid liniment consisting of a salve in which is incorporated oil of wintergreen, camphor, menthol, and eucalyptol, and put up in collapsible metal tubes. It is applied directly to the skin with the finger tips to relieve pain and to stimulate the surface circulation in sprains, bruises, lumbago, and rheumatism, and takes the place of liquid liniments, which we must rule out as far as possible in organizing the camper's kit.

Potassium Permanganate.—In tablets of one grain each is used principally in snake bite. Two dissolved in half a pint of water can be used for cleaning a cut or sore. It makes a good drinking water test. If water be pure, a bit of permanganate added to it will color it a beautiful purple; but if impure for drinking, the color will be a muddy brown.

First-Aid Wound Packet. (Johnson & Johnson, New Brunswick, N. J.).—An indispensable item containing all the materials necessary to temporarily dress almost any wound that can be possibly the result of any

outdoor injury, and so compact and portable that one is to be considered almost criminally negligent if he does not carry one constantly in a pocket when on any camp trip. The value of the dressing in this packet has been well established, and it has been shown that it can be applied by any person with little instruction and in the safest manner without danger of infecting the wound. Every one of Uncle Sam's doughboys carried one. In general first-aid practice it is used as a first dressing, a more permanent dressing to be applied afterward under more favorable circumstances. Often no other dressing is needed. It consists of one gauze bandage with compress attached, one illustrated Esmarch triangular bandage, and two safety pins. The Esmarch bandage is conceded to be the most useful in the world for it can be applied to any part of the body or used as a sling. It is put up in water- and dirt-proof cloth cover or in a thin metal can.

The *Dressings* required will be bulky unless you go to the trouble to secure those made by Burroughs, Wellcome & Co., New York, which are compressed. You will want for minimum necessities compressed cotton, one ounce; compressed plain absorbent gauze, one yard; compressed pleated bandage, two and one-half by six yards. Six small safety pins, small forceps, scissors, and a lance complete the list.

Adhesive Plaster is a closely woven, tough cloth, on one side of which is an adhesive surface of India rubber compound. Properly made it is adhesive at all degrees of atmospheric temperature and is unaffected by moisture, and the kind treated with zinc oxide is also

non-irritating to the skin. I have found but one kind that will stick and that is Johnson's Z O Adhesive Plaster. Primarily its use on the skin is as a protective covering, and to secure and maintain the greatest adhesiveness the skin must be perfectly dry and free from grease or dirt. It has a wide range of utility and is an important adjunct to present-day surgery and an indispensable unit in the first-aid kit. Compact, ready-to-use gauze dressings applied to any wound are nicely held in place by adhesive strips to the adjacent skin, thus eliminating the use of the roller bandage, which requires some training to put on to stay. The plaster should never be applied directly to a wound; first cover with cotton or gauze. By drawing the cut-wound edge together and tightly holding in place with adhesive strips, the effect is the same as a skin suture. Sprains are splinted (after the swelling goes out) by overlapping strips of adhesive plaster alternately over the heel and around towards the toes and over the heel and up the front of the instep. This dressing is ideally compact. The ingenuity of the individual will prompt many novel uses of the plaster outside of surgery, such as the repair of canvas, leather and rubber articles, sealing match tins and photo film containers, repair of splintered gunstocks, leaks in camera bellows; and by putting strips over the glasses of goggles and leaving but a narrow slit for vision, one mountaineer secured very good non-glare goggles for use on the snow and ice.

Carbolized Vaseline is used for burns, chapped skin, sunburn, and slight wounds.

The Uses of the First-Aid Kit

Wounds.—In the care of wounds the great essential is absolute cleanliness. All inflammation is due to germs, hence the cleansing of wounds and the use of surgically clean dressings prevent the entrance of germs into wounds.

Bleeding.—Stopped by the tourniquet, simple pressure with the cleaned finger over the bleeding place, or better, by firm pressure with cloths dipped in hot, boiled water. Once cleaned, do not destroy the clot that forms. Never use homely cobwebs to stop bleeding, as they reek with the germs of blood poison.

Pus germs are fewer in the woods than in the city. To exclude them, we paint with iodine the wound and the surrounding skin, or wash well in hot, soapy water and chlorazene solution and apply the first-aid; if the wound be fresh cut and not inflamed, the cut edges may be brought together and held with adhesive plaster strips across the cut.

A poisoned or infected wound (one we say that we have "caught cold" in) is characterized by the skin being red, shiny, swollen, and tender, and there is in all likelihood a pocket of pus beneath which must be drained out. (Do not procrastinate by poulticing and waiting for the pus to burst out; go in after it at once.) So we boil the lance, cleanse the skin, and cut open directly to the pus. We then cover the cut with sterilized gauze, which we keep wet with chlorazene solution so the discharge is changed daily and the wound kept open so it will heal from the bottom.

Sprains.—In a sprain the ligaments become bruised or torn, there is a loss of function and pain with in-

flammation. Pour hot water on the injured joint for an hour at a time, repeating every two or three hours for a day. If no receptacle is at hand to heat the water, fill a hollow rock, log, or waterproof cloth pocket with water, heat a stone in the camp fire and put into the water. Bandage the joint and keep applying hot water. Keep the limb elevated. When the swelling goes down, rub the skin with oil or grease, gently massaging the injured parts. Don't over-exercise so as to re-injure the torn ligaments. Walking off a sprain won't cure it, in fact, it only prolongs recovery. The adhesive plaster splint is described under Adhesive Plaster.

Fractures and Dislocations.—In a dislocation, besides the ligaments being torn, the bone is out of place at a joint, causing the arrested limb to be shorter or longer than its mate. Study how the bone slipped from its socket, for you must just reverse the movements occurring at the time of the accident in order to reduce the dislocation. A fracture is a severe malady, because a condition of shock is usually present. The affected limb is painful, the contour of the limb is changed, a grating (crepitation) is felt and heard when the broken ends are rubbed together. The ends are often by muscular action drawn out of position so that they overlap. Overcome this muscle tension by steadily pulling the two broken parts in opposite directions until the ends meet in proper relation to one another. This is imperative. Hold them in place by laying saplings of barks or sticks entirely around the break, interposing padding of soft material next to theskin, and then bandage all into place. If the parts are

swollen, apply cold water. Healing requires weeks for a good result.

Blisters.—When a blister arises, extreme care should be taken to keep from breaking the skin, thus leaving the raw, painful surface exposed. In treating, hold a needle or common pin over a flame to sterilize it, cool it, and insert it well under the skin at the edge of a blister sack; withdraw it, and the watery serum will escape. The skin over the blister is thus allowed to remain, flattens, and is the ideal protective. To further strengthen the skin, apply over it a dab of absorbent cotton and over this a short strip of adhesive plaster. A one-inch strip is then torn from the roll, in its middle, and on the adhesive side is laid another strip the size of the one over the blister. We now have the long strip whose whole outer surface and middle third on the under side is non-adhesive. When put over the blister there is play between the blister and strip and the outer protective strip thus takes up the friction, you can walk with it, and the injury, which might have marred a hike trip, can be disregarded.

Colds.—Take a hot bath and heroic doses of laxative. For the aches, pains, and fever take aspirin tablets (grains five to a tablet) one every hour for four doses, then one every four hours. If the throat is sore, gargle with salt water.

Diarrhœa.—Do not block up the bowels with opium. Stop all food, rest the patient in bed, give a purge, and after three good bowel actions give the intestinal antiseptic tablets, one each hour for three doses, then one every three hours for a day.

Sunstroke.—The skin stops perspiring, is hot and dry,

the face is red, and the head feels a great pressure of too much blood. Get to a cool place, lie down, loosen the clothing, and bathe the face, chest, and wrists in cold water, and drink as much water as wanted. In *Heat Exhaustion* the condition is opposite—the face is pale and the skin sweaty. You need stimulants, such as aromatic spirits of ammonia and then the tablet stimulant every three hours, or hot tea or coffee. Do not bathe the skin.

Estimating the Temperature Without a Thermometer.—The pulse and temperature are the important signs. The pulse is felt by placing the finger tips on the wrist inside the bone on the palm surface. It represents the force and rate of the heart beat, which is seventy-two per minute for the adult male. The pulse is decreased in fainting and shock or loss of blood, for the blood is collected in the trunk of the body. It is increased in rate when the heart pumps faster, as in active exercise and in infections of wounds, fevers, etc. If you have no clinical thermometer to determine temperature, you may roughly estimate it as follows: It is a fact that each degree of temperature above the normal (which is ninety-eight and a fraction) corresponds with an increase of ten beats of the pulse rate per minute (normal pulse rate is seventy-two). Thus, if a pulse beats 102 times per minute, the patient has approximately a fever of 101.

The thermometer, however, is certainly the only accurate means for readily determining body temperature. It is small in bulk, light in weight, and may be had with protective case that just fits it for the rough handling received by an emergency kit. Tycos brand

instruments of this kind are standard. If you get one, take a lesson in its use from your druggist or family physician.

Mosquito Dope.—The insect repellents used as body applications consist usually of some essential oil incorporated in a lasting base of oil or salve which establishes a durable glaze over the skin, preventing too rapid evaporation of the oil by the body heat. These dopes do not injure the skin a bit, and the slight discomfort they cause is compensated for by the immunity established.

Formula No. 1		Formula No. 2	
Pine tar	1½ ounces	Oil citronella	1 ounce
Castor oil	1 ounce	Spirits camphor	1 ounce
Oil pennyroyal	½ ounce	Oil cedar	½ ounce

Snake Bite.—The life of a patient bitten by a venomous snake depends upon what is done during the first hour. The poison is either quickly eliminated and the patient quickly recovers, or it rapidly destroys life. Time is all important.

If bitten by a snake, ascertain if it is of the poisonous kind. If so, the reptile has a pit back of the nostril, the head is triangular, the jaw is heavy, and the pupil of the eye is slit-like instead of round. The bite is a sharp sting followed by burning pain. There are generally two small wounds surrounded by an area of steadily increasing redness and swelling. The action of the poisonous venom is to depress the vitality, the heart beats and breathing are first increased and thens lowed (the normal pulse rate is seventy-two per minute and the breathing is sixteen per minute), perspiration

ensues, the mind becomes dull and the gait staggering. Our problem is to:

1. Prevent or retard the entrance of the poison into the system. This is accomplished by putting a tourniquet around the limb between the wound and the heart.

2. Remove or destroy the poison at its seat of entrance. The best treatment, although heroic, is to lance where the fangs have entered by making two cuts across each other like an X to promote free bleeding, and then rubbing in a crushed tablet of potassium permanganate. Cover this with the emergency wound dressing.

3. Neutralize the poison which has already entered the circulation. This is impractical in first-aid work, as a rule, because the antidote, *Antivenine*, is hard to get and is not effective against rattlesnake venom, which is the commonest type met with. But you can—

4. Hasten the elimination of the poison from the system by opening the bowels freely with laxatives, by drinking lots of water, and then—

5. Support the vitality of the patient. Alcohol has no place in the treatment of snakebite, for it does more harm than good, because it is a stimulant first and a depressant later. Our sheet anchor in stimulation is the Tablet Stimulant given one every three hours. The patient should lie down and the body be kept covered and warm.

Drowning.—In rescuing a drowning person we assume that he is not dead. If he has been submerged not over two minutes he stands a good chance for life, and cases have been revived after they had been submerged for

five minutes. Every second counts, and hours of persistent effort are often required. In rescue work:

1. Loosen the clothing to allow easy breathing.

2. Pass the finger into the mouth to remove any foreign bodies, such as tobacco, chewing gum, or false teeth.

3. Lay the body on the ground, face down.

4. Empty the lungs of water by grasping the body with your arm under the stomach and raising it so that only the feet and head touch the ground. Repeat several times.

5. With the victim lying on his stomach, face down, with the head turned to one side and resting on the cheek, extend his arms straight above the head. (An assistant may now draw out the tongue, holding it between the fingers.)

6. Kneel astride the victim facing his head and spread out your hands with palms over the lower part of the chest and loins, one on each side. Now with the arms straight, allow your body to fall forward, so that your weight presses the palms of your hands firmly against the body of the victim, which here is the most elastic part of the chest and region of the diaphragm, and causes the air to be expelled from the lungs.

7. Now spring back, releasing the pressure of the ribs and lungs, causing the air to be inspired into the lungs.

8. Repeat these movements, imitating actual breathing every four seconds, allowing two seconds for relaxation and expansion of the chest. When revived, remove the wet clothing, rub the skin, stroking toward the heart, wrap him in warm blankets, and give stimulants.

Transportation of the Wounded.—In order to carry a wounded comrade to a place where deliberate and more careful attention may be given, it is frequently necessary to improvise methods of transportation. The chief aim is to move him with as much gentleness and care as is possible, so that no further injury will be caused. An unconscious or injured man may be carried by one of several methods:

1. He may be thrown transversely across the shoulders. The patient is turned face downward; you lean over astride his body, facing his head; grasp him under his arm pits, bring him up on his knees, grasp about the abdomen and lift him to his feet. Grasp his right hand in your left, draw his arm over your head and onto your left shoulder; grasp his right hip with your right arm between his legs, hold his right wrist in your left hand, and rise.

2. He may be carried on an emergency litter made from buttoned coats or shirts, with the sleeves turned wrong side out and inside the closed garment, so that the collars of the closed garments are together. Two poles or oars are then slipped through the sleeves and the litter is ready. Holes cut in the corners of two gunny sacks will do as well as coats.

3. The travois of the American Indian consists of a litter supported between two poles sixteen feet long of young trees and harnessed one on either side of a riding saddle like the shafts of a wagon. The patient's head should be towards the front.

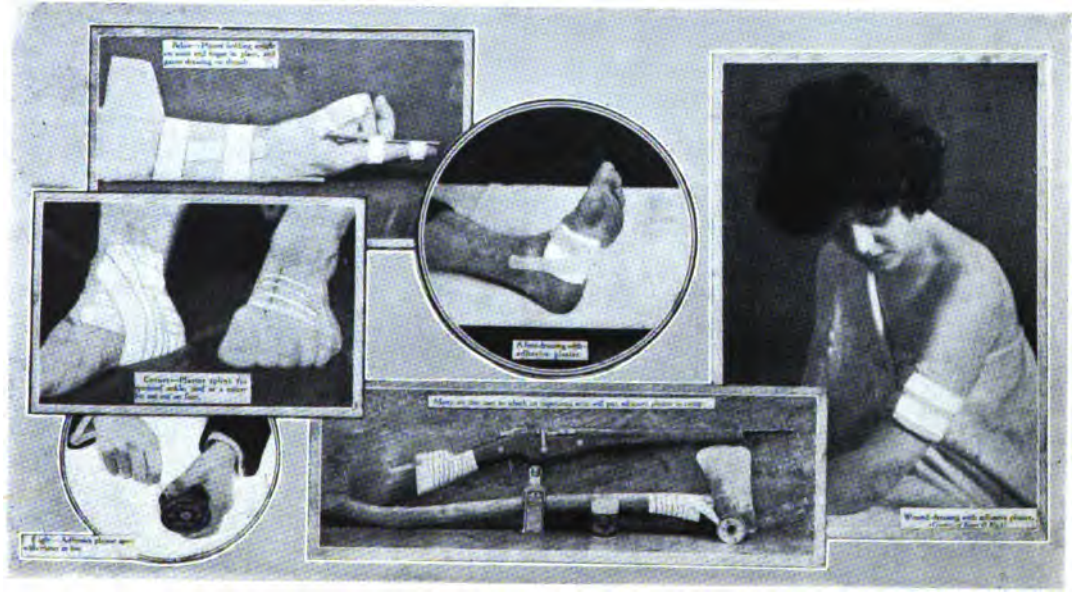
CHAPTER XV

Uses of Adhesive Plaster in Camp

FOLLOWING the serpentine irregularities of timber line on the continental divide in Glacier Park, the Mountaineer Club blazed the Skyline Trail. Featuring mountaineering in its sterner aspects, the route does not bid for much popularity with average tourists, but two hundred miles of it were safely negotiated by the intrepid climbers. Memorable of all days was the eighteen-mile jaunt from Red Eagle camp up through the narrow "chimney" or cleft in the sheer, rocky wall of the divide, then down over miles of shale and erosion débris, and farther on over the boulder field moraine fronting Blackfeet Glacier. At noon we came upon a tearful maiden who had sprained her ankle and was sorrowful lest the injury would not allow her to complete the trip afoot with her comrades, and still more perturbed because she was a good travel from the railroad and no saddle horse available.

Any accidental injury to the feet in a walking trip is obviously serious, for the perfect functional condition of these members and their protection by proper socks and shoes form the criterion of one's walking ability. To set at ease the mental perturbations of our campanion of the trail, we resorted to the use of adhesive plaster to repair the ankle. One is surprised to learn that a roll of this indispensable item reposes in every individual outfit, and that without it the seasoned

FIRST AID ON THE TRAIL



USES OF ADHESIVE PLASTER IN CAMP

traveler will not safely venture trailward with its dangers of contusions, blisters, and sprains.

By cleverly utilizing narrow strips of adhesive plaster, the injured ankle was splinted and the girl resumed her journey and completed it like the rest. The *modus operandi* in this case was to overlap one-half-inch strips of the plaster alternately (a) over the heel and around towards the toes, and (b) over the heel and up the sides and over the instep with the ball of the foot pressed back, exaggerating the flexion forward of the foot at the ankle. A space one-half inch wide on the front of the foot was left uncovered to allow for inevitable swelling. This dressing is ideally compact, allowing the use of ordinary hose and shoe covering, holding the injured tissues in position, and limiting the motion, which is the function of a real splint.

By reason of the work done by the hiker, blistering of the feet must be expected by a novice. This can be prevented or cured, as the case may be, by the use of surgeon's adhesive plaster, and of this indispensable item, each should carry a roll, size one inch by five yards, and specified as the zinc oxide plaster with its whitish adhesive surface.

Simply slapping on a piece of tape over an infantile or senile blister may be enough, but if one uses the following method popular among mountaineers, he will get results for certain. Directly over the blister and just covering it, is laid a dab of absorbent cotton, and over this is flattened a short strip of adhesive. A three-inch strip is then torn from the roll. In its middle and on the adhesive side is laid another strip, the size of the one over the blister. We now have the

long strip whose outer surface and middle third on the under side is non-adhesive. When put over the blister, there is play between the blister strip and outer protecting strip—thus taking up the friction. You walk with it, and the injury, which might have marred the pleasure of the entire trip, can now be disregarded as no more than a minor catastrophe.

One ingenious mountaineer, when caught on a glacier in midday without his amber goggles to protect his eyes from the intense ice-glare, placed strips of adhesive over his ordinary spectacles, leaving a narrow slit for vision, and thus produced very acceptable anti-snow glare vision protectors after the style of the Far North natives, who use eye coverings which entirely shut out the light except for the narrow slit through which they see.

Surgeon's adhesive plaster consists of a closely woven muslin or grilling cloth over one surface of which has been spread an adhesive mixture of India rubber compound. It is made less irritating to the skin by the addition of zinc oxide at the factory. It is flexible, easily manipulated, is quickly adhesive, and will not slip. It is procurable at any drug store and you should insist upon getting *zinc oxide* adhesive plaster. Some kinds will not stick where you want it to.

To secure and maintain the greatest degree of adhesiveness, the surface upon which it is to be applied must be perfectly dry, for if the least wet it will not adhere. The surface must be entirely free from dirt and grease also. Hairy skin should be shaved before applying the plaster. Adhesiveness is best obtained

when the plaster surface is slightly warmed to soften the adhesive material.

In removing, a quick jerk will most easily effect results with only minimum discomfort to the patient. Liquids which render removal rapid are either alcohol, gasoline, or benzine poured between the loosened edge of the plaster and the skin. Never wet the cloth side or back of the plaster, as the cloth may then separate and leave the mass upon the skin.

Adhesive plaster plays a most important part in the technique of modern surgery, in which its utility is recognized and practically universally employed. Among the chief uses of the plaster is in connection with first-aid work, where it is considered as an indispensable item. It acts as a covering, a dressing, a protective, a support, a bandage, a compress, and a suture, or in place of a stitch to hold wound edges together. Plain zinc oxide adhesive plaster is not to be confused with the medicated kind, such as belladonna plaster; for the plain kind does not carry active medicaments to the surface to which it is applied.

For the treatment of little cuts on the skin, hangnails, abrasions, and to prevent friction over corns and bunions, adhesive plaster replaces flexible collodion or new skin, which is liquid and not easily handled.

In treating injuries of the skin, adhesive plaster is a decided improvement over gauze bandages as a means of holding dressings in place. Take for example a small puncture wound which has been treated with soap and water and then painted with iodine; a small gauze compress is placed over the wound and retained

with strips of adhesive plaster so placed as to extend sufficiently well beyond the sterile field to prevent slipping and exposing the wound surface to open infection. This is much more satisfactory than roller bandages, which require some training to "stay put". Never cover an open wound directly with adhesive plaster, but interpose first a wad of sterilized cotton or gauze. Thus on an axe wound of the foot, a long strip of gauze covers the line of the wound, and cross strips of adhesive plaster are drawn over it taut so as to pull the cut edges together and hold them in place, thus taking the place of a skin suture or stitch.

If a dressing is to be made over an unequal surface, as an ankle or elbow, it is a general rule that the narrower it is practicable to make the strips, the neater and closer fitting will be the dressing. Little slits crosswise in a strip which is to be placed over a rounded surface, such as the end of a finger, will allow overlapping of the slit corners, and the result is a complete covering and neatness in dressing. It can be readily formed to make a complete finger stall or cot.

Adhesive plaster is indispensable in dressing fractures and dislocations to hold splints in place or to form a splint dressing itself by limiting motion of the affected parts. Details can be worked out more completely in connection with a thorough knowledge of first aid as applied to the various kinds of bone and joint injuries.

A very effective treatment of a boil is to touch the tender center with pure carbolic acid on a match end, and then cover the whole inflamed area with a disc of adhesive plaster slit to the center so as to overlap.

The cutting edge of the lance in my first-aid kit is

protected from dulling by being wrapped in an adhesive plaster strip until needed for use. Lacking a sheath for camp knife or axe, which is to be carried in a pack, need not worry us, for we simply cover the edges with our plaster, and the edge as well as pack contents are protected.

The ingenuity of the individual will prompt novel utility of the adhesive besides its uses in first-aid work. It has a multitude of uses in the camp, household, and workshop. Adhering as it does to tin, metal, wood, glass, and rubber—in fact to any dry surface, it can be employed to get a better grip on handles, such as axes, hammers, golf sticks, ball bats, tennis racquets, or auto steering wheels. Used to bind tight the lids on cans, such as matches or baking powder, it protects the contents from climatic changes, light, and moisture. We use it to seal down the corks or glass stoppers of bottles, and to strengthen cracks in window panes, on glass dials of watches or compass crystals.

Adhesive plaster is a cheap, strong binder that will conform itself to the shape of any substance. Thus we mend with it splintered gunstocks, broken tool handles, broom handles, chair legs, whips, canes, umbrella handles, jars, and bottles. Even lead and iron waterpipes can be temporarily repaired by its use. Employed to bind a wood split or to hold a loosening ferrule of a fishing rod, it prevents the loss of a day's sport. Further, bowlers, fishermen, golfers secure protection to the fingers and hands by putting adhesive plaster strips over the parts most likely to be blistered, sore, and chapped. Being a non-conductor and waterproof, it is useful in making and repairing electrical

apparatus and in insulating wires for troublesome short circuits about the automobile.

About the automobile, adhesive plaster can be of service to loose tires, for the emergency repair of small blowouts, for patching inner tubes, for fixing leaky radiators, to "stop" rattling windshields, to repair broken celluloid windows, and with it even a temporary fan belt may be made.

The cloth bucket carried in my pack on a hike trip was once accidentally cut by too close proximity to an unprotected axe blade, and a repair was quickly and effectively made by putting a strip of adhesive plaster on the inside and finely stitching the edges with thread. Also, the balloon silk tent was torn on a sharp sapling and the repair effected by sewing adhesive plaster on the outside to shed the water. Torn clothing can be likewise repaired.

Many other uses will suggest themselves, such as the repair of canvas, leather and rubber articles, for sealing photo-film containers, and to cover a light leak in the camera bellows.

The uses of adhesive plaster in camp are apparently limited only by the ingenious resourcefulness which marks the expert woodcraftsman. Properly utilized, it will come to form an integral part of any camp outfit one may devise, for many times it will supply an absolute need, and finally come to be a necessary unit to the "boiled down" equipment which experience has taught you to be that irreducible minimum which is consistent with comfort and safety.

Fishing Rod Splices.—H. J. Blacklidge describes a clever method of first aid to broken fishing rods. He

describes the break as being across the long axis of the pole. He takes each broken end and whittles it down to a long bevel, smoothing the irregularities until the two long bevels fit perfectly when placed together. Then they are covered with a thin layer of shoemaker's wax and pressed tightly together.

Next they are wrapped with well-waxed silk. Let the end lie along the rod and wrap over it a dozen turns in beginning. Wrap carefully until you have gone beyond the beveled part. Then, to tie an invisible knot, make four or five loose loops and pass the end under the last lap of the winding. Now, as you go on winding, the loose loops you have just made will unwind. When they are all unwound pull the end through and cut it off close up and—go fishing. It is well also to have a bottle of shellac along with you and give the splice a coat of it. The above method has been tried by the writer who, lacking shellac, found that adhesive plaster greatly strengthened the splice and that even the threads were not needed. This is not so water-resisting as it would be if shellacked.

Repairing Bicycle Tire Punctures.—Adhesive plaster has found its way into the esteem of bicycle users, because it can be effectively wrapped around the tube over a puncture. This plaster prevents the egress of air from within the tube, and the tough, durable cloth upon which the plaster is spread allows a surprising amount of wear. Wrapping entirely around the tire and rim between the spokes prevents the creeping of the tube when the wheel revolves, endangering the value.

Pleurisy.—Without medical skill you can relieve

the knife-like, cutting pain experienced on breathing by a patient with pleurisy. It generally appears on one side only, so we limit the motion of breathing on that side in order to render less frequent the excursions of the lung covering over the chest surface. We use six or eight wide strips of adhesive plaster whose length is from the spine around to the midline in front. Instructing the patient to empty his lungs of air, we apply one end of the first strip to the spine below the level of the ribs and pull tightly around to the front and press down snugly. After a breathing spell, repeat with the next strip above the first one, but overlapping it a half-inch. Of course, this is usually the doctor's job but, in emergency, when you are far from such help, you can employ the procedure yourself without fear of aggravating the trouble and with immense relief to your patient.

Emergency Candlestick.—Sharpen a stick and drive it in the ground; to its upper end bind a candle with a loop of adhesive plaster and you have a holder which you can move any place and which has a free top which you can easily drive into the ground without interfering with the candle itself.

Waterproof Match Box.—The catastrophe of being forced to make a bivouac camp and the realization that all of one's matches are wet is something that will, as a rule, happen only once to every man. He will as soon as possible get a waterproof match container.

Glass bottles are taboo in outfits; special hard rubber or metal match safes with screw-down caps are satisfactory. But—why not make one yourself? A ten-gauge brass shell will just chamber a twelve-gauge,

and the connection can be covered with adhesive plaster to prevent absolutely the entrance of water. One sportsman uses the box that the Gillette safety razor blades come in, and seals the lid water-tight with his adhesive plaster roll. In a party outfit there should be a large canister of matches for replenishment of personal needs. This is made damp-proof by simply running adhesive plaster around the juncture of the top and can.

Thumb Stall.—A unique device, appealing to all fishermen who do surf casting or heavy sea fishing, is the leather thumb stall with an adjustable harness over the wrist to hold it in place and keep it from working loose and running into the reel. Quite the same effect may be obtained by wrapping the thumb with overlapping layers of adhesive plaster, which sticks so well as to do away with the need of harness. It prevents blisters, cuts, and burns from a fast-running fishing line, and, fitting so snugly, presents no danger of catching in the gear of the reel.

Fountain Pen Break.—One winter morning a certain school teacher found his fountain pen frozen up and a linear crack along the barrel leaking the ink. Wrapping the barrel firmly with adhesive plaster strips closed the opening and the same pen is in service with its wrapping unspoiled.

Unscrewing a Can Cap.—The canoe glue, taken in an emergency repair kit on a prolonged canoe and portage trip one summer, was marketed in a tin container with a screw-on cap whose threads became coated with glue, and contact with the air had so hardened and sealed the connection as to make it non-movable by the usual

finger-grip method. Adhesive was put around the cap, and where the prolonged ends met, the strip was clinched with pliers and the cloth held sufficiently tight to allow considerable twisting and the removal of the lid.

Camera Tripod Break.—I once went into the mountains with a professional photographer hired by a railroad company interested in exploiting the scenic advantages of the region. With his heavy 8x10 camera he used a cumbersome tripod. One day in loading the horses preparatory to departure, the pack horse clumsily stepped on the tripod. With fear and trepidation, the photographer picked up the broken pieces, which could be replaced only in a shop miles away. The broken shafts were most cleverly spliced so as to stand hard usage by wrapping pieces of thin tin, garnered from the metal case of a first-aid outfit, over the breaks and tightly covering with adhesive rollers.

Reel Seat and Rod Handle.—One sportsman I know of has a failure of buying every item in equipment that comes to his notice without due regard to utility and without trying things out until he gets into camp. A new fishing outfit was ordered and awaited him at the rendezvous for his annual fishing trip. He was dismayed to find so much play between the reel seat and the rod handle, on account of a loose-fitting reel band, that its use was out of the question. A few simple turns of the indispensable adhesive plaster held all movable parts tight, and he went on his way rejoicing.

Canoe Leak.—No canoe cruiser should start out on a trip without a few indispensable requisites such as glue,

canvas, white lead, calor, varnish, and copper tacks. Should a submerged tree trunk jab a hole in the bottom of your Peterborough, there is needed a cover for it and a waterproofing compound over all to make the repair lasting. Caught in the Northern Lake wilderness in such a predicament without the standard repair kit at hand, one man mended his canoe by drying in the sunshine perfectly the surface around the hole. This he covered well with wide adhesive plaster strips, overlapping both inside and outside the canoe shell. This he covered with pitch secured from the nearby forest, and the repair was waterproof and lasting. Similarly, a cracked blade of a canoe paddle may be treated; or if a handle be broken, whittle down the broken ends to rather long bevels which exactly fit one another and cover snugly with overlapping adhesive strips.

CHAPTER XVI

Pests of the Wilderness

THE outdoor man studies pretty carefully any method or utensil which will make his life in the wild place comfortable. Nothing so styles one a tenderfoot as the statement that he is going out to "rough" it, when, as a matter of fact, the old timer cleverly utilizes every ruse of woodcraft to "smooth" it, and he succeeds, too. Hunger, thirst, accident, and insect pests are all probable factors in marring a trip, but they can be successfully met by the one who knows how, and they may then be considered as catastrophes of but minor importance.

Any measure which may be employed to diminish the annoyance, discomfort, and danger of the various forms of insect life which may be met with in the wilderness will prove a welcome addition to the lore of the camper.

The bite of the mosquito is an active poison to most people and causes an active area of distressing inflammation, but this passes away with no more than temporary annoyance. Certain forms of mosquitoes and other insects have been found to be active conveyers of deadly diseases. Malaria, as is well known, is spread by a certain mosquito, and to his discredit is also laid the conveyance of the deadly yellow fever and elephantiasis. Fleas spread the bubonic plague; another member of the insect family spreads the sleeping sick-

ness; and still another conveys dangerous eye diseases and typhoid fever.

Since sportsmen's fields are getting farther and farther away from the centers of civilization, the geographical distribution of these harmful insects is of particular interest to outdoor men. In a general way they are worse the farther south or north we go. Their disturbing prevalence in tropical regions, where the sportsman, miner, or engineer may be called upon to live a camp life, is well known. Not so many varieties are found in the colder regions, yet certain ones are found to thrive there in surprising numbers; cold seeming to make no difference in their successful propagation. At the time of the great rush to the Klondike gold fields, the Government placed before the public a bulletin enumerating the hardships as well as the possible rewards of Alaska adventures, and the multitudes and voraciousness of the mosquito were cited as the chief factor in many a man's failure to reach his coveted goal.

Some subarctic travelers consider the mosquito and sand flea the worst hardship to which they are exposed. The open plains are the kingdom of the scourge, which assemble in countless numbers at the bait of men and animals, and whose thirst for blood, querulous singsong, and poisoned sting have actually driven strong men of otherwise undaunted spirit to cry for mercy and to become savage and desperate in helpless anger. Horses have been worried to their death, and many notable instances are recorded where bears have been blinded and driven to mire themselves in mud wallows for protection and have been starved to death.

Insects come out of the pupæ at the first sprouting of vegetation in May, and they stay until the September frosts. In Alaska all animals leave for the snow line when the mosquito pest appears, but the wary blood-suckers follow even to the bleak mountain tops above timber line. In a recent bulletin from the Government Printing Office there appears the following: "In general, the food of mosquitoes consists of vegetable juices; unfortunately, the female of the species has developed a taste for blood, and indeed a feed of blood has become indispensable to some of these for the full development of their eggs. Remembering how all-compelling the generative instinct is, we can now understand why the 'Stegomyia calopas', for example, will, when disturbed, return again and again in an endeavor to obtain her fill of this life-giving fluid."

In regions marked by unusual prevalence of insect pests, the sportsman has no business until the season is favorable. In addition to the above extremes cited, we are obliged to consider the mosquito pest when we are on pleasure bent, even in territory which is climatically more kindly.

In our more temperate zone, the mosquito is very apt to be encountered. The North Woods traveler may also have disagreeable dealings with deer flies and black flies, buffalo and turkey gnats, while as we journey southward we meet the villainous screw-worm fly and the revolting blowfly, which lays its eggs in wounds or in the nostrils of sleeping men. Tropical tourists may also expect, in addition to the mosquito, the *gusanero* and *birui* of the Amazon, and the *motica* of Brazil, which is much like our black fly.

PESTS OF THE WILDERNESS

The plague of insects is noticed in retreat before the plow, and of course the sportsman's work takes him into the remoter regions. They are distinctly a factor to be reckoned with for a period of about six summer weeks in the open country of Michigan, Manitoba, Ontario, and the Canadian Northwest, while in the forested portions of these states they persist for two months, and in the subarctic regions for two and a half months.

Individual physical make-up differs widely in the susceptibility to the poisons of insects. Some persons are entirely immune and need take no precautions whatever for prevention. Others are poisoned violently by a single bite, and many are so constituted as to prefer to forego the pleasure of an outdoor trip entirely rather than subject themselves to the rigorous discipline of dopes, headnets, and other preventive measures.

In general, it may be said that it is well-nigh impossible to get used to insect annoyance, but certain measures of prevention may be used which will greatly impede them, and one can get used to these measures. Every outdoor man has his pet methods of prevention, hence we may expect widely divergent views expressed. About the best advice to offer is that you try the different methods advocated and learn by experience which is most suitable.

The simplest method for discouraging mosquito onslaughts is the mosquito headnet. This consists simply of a loose-fitting sack, attached by a draw string over the hat crown, and draping down over the head to the shoulders, where it is secured by tapes fastened about the chest. If made of bobbinet, it is transparent to some

extent, but the scenery partakes of an uncanny prismatic coloring. This material is not very durable, is expensive, and will not adequately protect against smaller insects. By far the best material is common white, or preferably black, cheesecloth. The portion in front of the eyes may be filled with small windows of transparent celluloid or an unexposed photographic film which has been cleared of the emulsion in a hypo bath.

With the headnet are usually worn cotton gauntlets for hand and wrist protection. The objectionable feature of the headnet is that it is always in the way and presents an attractive lure seemingly for being plucked to pieces by all the brush you pass. While it keeps millions of the pests out, yet the one or two stowaways which may remain within can give you all kinds of distress. The headnet allows you neither to spit, smoke, eat, nor drink; yet this form of prevention is really the best to use where there is much open-country traveling.

In his *African Game Trails*, Roosevelt states that "it was generally necessary to wear headnets and gloves in the evenings, and to go to bed at once after dinner and then to lie under the mosquito bar with practically nothing on through the long, hot night, sleeping or contentedly listening to the humming of the baffled myriads outside the tent".

One should sleep well on an outdoor trip, and to guarantee a good night's rest, as far as insects are concerned, the pests may be made to leave in a hurry if a smudge is burned in the tent or if gunpowder is ex-

ploded therein. Common insect powder is also of service. Although nine out of ten persons sleep in open tents, they would do well to have the tent home-made, mosquito-proof. Stewart Edward White recommends an inside tent of cheesecloth to be suspended within. It is an exact replica of the outer tent, but is more voluminous and with bottom margins long enough to snugly fit the ground and close possible gaps which might permit the entrance of the despised ones. The dweller enters his domicile by lifting the loose meshes of the inner tent. In the daytime it may be hung up out of the way. This is a very practical solution of the mosquito pest problem at night.

Smoke is generally a specific against insect pests. The Indians make a tiny blaze of birch bark and pine twigs deep in a nest of caribou leaves and grass. In making a smudge, be sure to start the fire well before you put on the green stuff.

The following procedure will also be found useful in repelling the pests of the wilderness and is a somewhat new application of an old remedy. Take an ounce of common Epsom salts and dissolve it in a cup of water, wet a bath cloth so that it will not drip, and rub the body well all over, and do not wipe afterward, but dress, and flies, gnats, fleas, bedbugs, mosquitoes, etc., will never touch you. If one is exposed more than usual, being near water or in a forest, then make a somewhat stronger solution, wet a cloth and rub the face, neck, ears, and hands well; do not wipe, but allow it to dry. It will leave a fine powder over the surface that the most bloodthirsty insect will not attack.

Besides, the solution is healing and cleansing. It will heal the bites, subdue the consequent inflammation, and cure many diseases of the skin.

Temporary protection from the onslaughts of noxious insects may be secured by the use of one of the various dopes which are to be smeared on the skin. Essentially they depend upon the action of some one of the essential oils, which are obnoxious and repellent to the pests. Unfortunately, they may prove also a discomfort to the individual's use, but he is likely to prefer ill-smelling drugs to poisonous insect stings—the lesser of two evils. As a sort of first aid, by utilizing materials at first hand furnished by Nature, may be mentioned crushed dock or caribou leaves rubbed on the skin.

The oils which are effective, named in the order of their general preference, are: Oils of pennyroyal, citronella, lavender, cloves, eucalyptol, camphor, phenol, and creosote. They may be used entirely alone, but on account of their volatile nature they are evaporated too fast by the body heat, so they are best incorporated in some oily base which holds them in action on the skin for a greater length of time and thus precludes the necessity of very frequent application. The thinner oils require more frequent application and are, withal, pleasanter to use.

These mosquito dopes may then be either (a) liquid, such as sweet oil, parraffin oil, glycerin, castor oil, or oil of tar, or (b) an ointment or salve, such as vaseline, simple cerate, or lanolin. The ointments produce the desirable lasting glaze. Pure pine tar is the best repellent, combining, as it does, thickness, a volatile substance repugnant to mosquitoes, a healing power, and pro-

ducing a lasting glaze. This glaze browns the skin like an Indian's, and with Stewart Edward White you will agree that "at first tar smell will bother you, but in a short time you will like it, and it will call up in your memory the reaches of trout streams."

Nessmuk's mosquito dope formula is best known and quite satisfactory. Of it he says in his admirable classic on *Woodcraft:* "More than forty years' experience in the woods has taught me that the following receipt is infallible anywhere that 'sancudos, moquims,' or our own poisonous insects do most abound. It has been pretty widely quoted and adopted, and I have never known it to fail: Three ounces pine tar, two ounces castor oil, one ounce pennyroyal oil. Simmer all together over a slow fire and bottle for use. You will hardly need more than a two-ounce vial in a season. One ounce lasted me six weeks in the woods. Rub it in thoroughly and liberally at first, and, after you have established a good glaze, a little replenishing from day to day will be sufficient; and don't fool with soap and towels where insects are a-plenty. A good safe coat of this varnish grows better the longer it is kept on—and it is cleanly and wholesome."

Ernest Thompson Seton has another good formula, as follows: Oil pennyroyal, one part; oil tar, one part; spirits camphor, one part; sweet oil, three parts.

Dr. Edward Breck offers another good combination composed of tar, three ounces; castor or olive oil, two ounces; heat together, then add and simmer: oil pennyroyal, one ounce; creosote, one ounce; oil citronella, one ounce; carbonated vaseline, large tube. For ladies' use, omit the tar.

A very simple combination is two parts tar and one part vaseline. A single application is enough; it becomes tacky, and in ten minutes hardens so that nothing can rub it off.

To properly mix these dopes, they should be slowly simmered over a slow fire. The skin is not injured by these combinations even if frequently applied, nor are they uncomfortable to use. Even so, any objectionable feature is compensated for by the immunity established against the assaults of the pests.

CHAPTER XVII

The Indispensable Parka

A NEW clothing idea, gleaned from Arctic experience and one which bids fair to be widely adopted by the outdoor fraternity, is the hooded shirt called the Parka. When Chinaman John wore his shirt in the customary loose-waist fashion and appeared before his employer one cold morning saying "belly cold," and was admonished that if he would wear his shirt inside his pants his "belly wouldn't get cold", he simply suggested something to an individual which upset conventional ideas of dress. The parka is worn outside and for very good reasons—it won't let the wearer get cold.

The average sportsman emphasizes his choice of food more than that of clothing and bedding, yet a wilderness trip necessitates a proper selection of all, if he is to be ready for any exigency that may arise. Several sorts of weather are in the category of the camper, and protection against all, with as little weight and bulk of clothes as possible, is the problem solved by adopting the parka. One may be in active exercise in dry, still, 45-degrees-below-zero cold; again, he may be physically inactive in a 20-degree-below-zero gale on open water; or again, caught in a day-long rain, wet snow, and sudden weather changes when travel is absolutely necessary, and each demands ample protection, which the parka furnishes if it is made of proper materials to suit the purpose.

Did it ever occur to you that the clothing you wear does not per se produce warmth? Neither heavy wool nor any weight of cotton *produces* heat—it is the human body that manufactures heat; clothes merely act as heat retainers—they are employed to prevent rapid emanation of heat and to insulate the body temperature against outside changes, which would influence heat dissemination.

The secret of body warmth, then, is to secure non-conducting fabrics whose index of absorption is lowest and these are always of animal origin—fur is the best, woolens next, silk is good, and cotton lowest. Fur holds a great amount of confined air, as does also loosely woven wool. In fur we get the desirable dead air spaces; in several layers of thin wool fabric we get the same; but cotton rapidly draws out the heat and moisture from beneath and emanates it to the outside.

The production of body heat is ample when a man is in active exercise; our problem is to conserve it, and it is best done thus—next the skin wear loose wool, and to prevent the wind and low temperatures striking this, wear a wind-proof parka of cotton drill or pongee silk. If you wish an ideal rain-proof garment, make the parka of balloon silk—white, tan, or green. It won't protect your pack, but the pack sack should be waterproof also.

Interesting experiments with the parka under guise of its various aliases in different portions of the land of the Great White Silences are related. Dr. Frank Russell, in his *Explorations in the Far North*, describes a rain frock seen at Cape Tchaplin called the Massinka Rain Coat. It is a frock of seal intestine, ornamented with narrow strips of the fur seal on the

shoulders and hood, and with the hair of the young seal sewed upon the outside of the seams elsewhere. The hood is small and close fitting. The strips of intestine are four inches wide and six feet long—the garment being three feet across at the waist. There are eight breadths in front, making it thirty-two inches long. It is very light and flexible and perfectly waterproof.

The Kooletah or fur jacket with no buttons, going on over the head, is a description given by Robert E. Peary. In summer it is made of sealskin and in winter of fox or deer skin. His own was made of Michigan sheepskin. Attached to this jacket is a hood, and around the face is a thick roll of fox tails. Ponting, of Captain Scott's Antarctic Expedition, says that for the Antarctic wool is better than fur and should be covered with a thin windbreak. The parka is here again suggested as the ideal body covering.

All properly made clothing for extremely cold countries should be very large and adjusted so that it can be readily removed, is the observation of Lieut. Waugh. The fur parka is a garment made like a large hooded shirt coming down to the knees, the edge of the hood having a ruff of wolverine, wolf, or bear skin to protect the face (wolverine being the best, as it is the only fur upon which the breath will not congeal), and it is the most practical garment yet devised for Arctic work. This parka is made of reindeer summer skin (the winter skin sheds too badly) or squirrel skin. It is worn with the fur outside, and is lined with fur or some material which will allow it to slip off and on easily.

The drill parka which is used to break the wind is made on the same model, only larger, as it is at times

worn as the outermost garment of all. These fur parkas are seldom used by those who are experienced. When working on the trail, they are held in reserve until camp is reached or until the trail is good and riding is possible; when pushing on handle bars or running behind the sled, the parka would be too hot and would cause perspiration to start—the cause of inevitable chilling, for nearly every death in the Arctic is from getting too warm or wet, and not from excessive cold.

Anthony Fiala uses a parka of pongee silk which successfully keeps out flying drift and wind. During halts he takes off his parka and puts on another heavier fur shirt and then the parka over all. There should be no opening in front, as cold air goes in between the flaps. It is best to use a llama sweater and over it a light closely woven pongee silk parka like the hide of fur to keep the heat in and the cold out. Parker, on his Mount McKinley climb, wore such an one and found it quite satisfactory.

Any seamstress who can make an ordinary work-shirt can make an Adicky (parka), if your outfitter cannot supply you. Dillon Wallace asserts: "The garment is slipped on over the cap as a neck and head protection. The neck opening is large enough to permit the head to pass through it without the necessity of a buttoned opening in front, for no matter how closely buttoned a garment may be, drifting snow will find its way in. In length, the Adicky reaches halfway between the hips and knees, and is made circular at the bottom. The hood should be of ample proportions, pulled over the cap loosely, with a draw string encircling the front by which it may be drawn snugly to the

face, a fringe of muskrat fur acting against the drifting snow. While Hudson's Bay kersey cloth is a favorite fabric for this garment, it may be made of any woolen duffle or similar cloth.

Over the kersey Adicky, another Adicky of some smooth-faced, strong material (preferably moleskin) should be worn. This outside Adicky should be, of course, just enough larger than the kersey or blanket Adicky to fit over it loosely. The Adickys may be worn singly or together, according to the demands of the weather. In far Greenland, the natives wear an Adicky of caribou skin, hair side out, called the "Kulutah"—in Labrador, the "Kulutuk".

So good a mountaineer as Miss Dora Keen recommends that the drill parka become a necessary addition to the equipment of every serious alpinist. "On knapsack trips and woods cruising, as well as in general mountaineering, I have used the parka and it 'stays in' as an integral part of my high efficiency pack kit, and I am thus ready for any weather emergency which the Red Gods may pit me against. The weight of twenty-five ounces is of slight consequence, and when worn it allows freedom of movement and ample body protection equaling many pounds of blankets."

The unconventional parka costume savors of generations of trail mushers in the region of the Great White Silences. It was born of necessity, just as the old rivermen and lumberjacks "stagged" their pants and shirts, just as the Alaska miners used sour dough instead of baking powder, just as Nessmuk made his famous dope for the "no see ums", and the Indians fashioned their teepee tents so they could use fires within.

CHAPTER XVIII

Game Hunting With a Camera

THE camera represents, in a certain useful sphere, the conservation of wild creatures for the sake of pleasure, science, and art. Game hunting with a camera is every bit as novel as hunting with a gun; there are no closed seasons; and one gets the excitement and must display skill in stalking. To make good pictures of wild things, certain conditions are essential. You should have a good light, preferably from behind the machine; the wind should be blowing toward you, as in gun hunting. In fact, most of the conditions should be similar, but even more favorable for photographing than for shooting, because not only must proper sights be made, but one must get the right exposure to "stop" the bird or other creature.

In the way of equipment a film camera is recommended on account of portability and general range of utility. One should have a ray filter which controls the color values that must be contended with where they exist in such contrast as in nature; a tripod helps to overcome the greatest cause of failure—underexposure; and lastly, an anastigmatic lens admits sixty per cent more light than does the rapid rectilinear.

In woodland views when the sun is low one can get an atmospheric softness of the middle and far distances by focusing on the foreground. By using the smallest stop the light will allow, one can get greater detail, which is

a great help in enlarging later. Take most views when the sun is at your back, for if it shines directly into your lens the light goes through the emulsion and is reflected back to the emulsion, producing a blur called "halation". You will notice this where the light shines through the tops of trees or when the light comes through the windows in interiors.

Aside from the outfit and technique of photography, to properly portray wild life in native habitat, one needs a knowledge of field craft concerning the habit of wild animal life and the ability to keep oneself under cover so as not to arouse suspicion. The accustomed alertness of the kindred of the wilds promotes an intense curiosity toward things foreign, hence to prevent fright, extra precaution is due. One should make no sudden movements.

The wildest animals are governed by two predominant forces in their natural make-up—love and hunger—and these things are taken advantage of in wilderness photography. For instance, a study of the food habits of birds in winter time will result in the placing of the camera at a given position with the almost certain arrival of the subject.

Deer will invariably dart away before one can get within twenty yards of them as they are very keen, relying more on the sense of smell and hearing than of sight. One had best begin his nature-study photography with the common birds of the neighborhood. They are usually abundant, easily found, and they offer the greatest facilities for this kind of work. Take the wood thrush for example. Her strong plumage markings show up well in a print, and her nest is generally located

at a convenient distance from the ground. Focusing should be done while the bird is away. Cut away as few branches as possible, and in adjusting the camera to trees, use the ball and socket kodapod instead of a tripod. If you have a long focus lens, use it, although a single combination lens will produce a photo of good definition. The common fault is underexposure. By using the smallest stop, the surroundings are brought into focus. If the bird is wild, use a long rubber tube to operate the shutter lever or attach a string to the same.

Hunting with a jack-light is illegal, because the animal has a poor chance for a safe getaway, as the light—first noticed out of curiosity—blinds them. Advantage is taken of this in flash-light photography. Rig up a fourteen-foot boat with a frame on its prow, and on this place two cameras focused at thirty and forty feet respectively. Above them place a jack-light fitted with a strong reflector to get into position, have a flash gun and powder ready, and when exposure is to be made, open systematically the shutters, set off the flash, and then close the lens.

The flash light can be further utilized in recording delightful camp-fire memories. Set the camera on a stump or tripod focused on the crowd lounging about the camp fire. Point the lens toward the fire also. Fasten the sheet of flash paper to a long stick and, standing between the camera and the fire to prevent fogging of the film, open the shutter to the widest aperture and drop the flash into the fire.

The most worth-while place to photograph wild life is in Yellowstone Park, and a trip into this great wild-

GAME HUNTING WITH A CAMERA

The minimum in wilderness photo equipment comprises a compact camera and a fast lense, a ray filter, a tripod or kodapod and range finder and an exposure meter.

animal refuge is certain to reward one with many priceless pictures. As one leaves the train at the Park entrance and traverses the "skillet" route, the wonders of the Yellowstone unfold until near the end of the trip the grand climax is reached in the famous Lower Falls and the Grand Canyon.

Two of us on a hike trip in this last sanctuary of our fast-vanishing wild life had many interesting observations. We journeyed from the west entrance through the narrow forest aisles of Christmas Tree Park, alert for the first sign of the unusual. Warm vapors arose in the cool morning air from the surface of the Madison River, which was joined just a short way above by the Firehole River, whose waters come from the Hot Springs.

Presently we espied a deer on the opposite shore standing knee-deep in the lush grasses of the water's edge, and the graceful contour of the body and symmetry of antlers called forth admiration. Here was animal life in natural habitat far from the cities' noise and strife. Here was the scene so often witnessed by the pioneers of days far gone. Presently, with one startled glance, he gracefully poised antlers and quietly bounded to the forest cover, where he disappeared.

Uncle Sam allows no guns to be used in his public domain, but the camera enthusiast enjoys unlimited freedom. If one really wishes to study animals, he should leave the gun at home and take a camera, for by close watching one can get an intimate knowledge of the habits and home life of the denizens of the wilds.

So as not to disturb such animals as might come

across our paths, my companion and I kept our distances from the many tourist conveyances carrying sight-seers. We were after photos. Many times we followed deer or bear a short way into the forest or meadows to gain better advantage. I like the bears. Rough, shaggy, and clownish fellows that they are, they afforded unending amusement and novelty, especially to a prairie dweller who was quite foreign to their habits. They were mostly browns and blacks, but at the lake and Grand Canyon there were many grizzlies. The latter were comparatively tame, considering their reputation for viciousness, and they were not hard to photograph. One must not lose sight of the fact that they are yet wild animals, hence should not be molested.

Most of the bears had their rendezvous near Mount Washburn, and distinct trails could be followed to their ranges. Following one of these, I beheld in a clearing ahead an old mother and her two cubs. Her movements were cautious. She would sit upright, scent the air, turn her head from side to side and look in every direction. Quite comically the cubs would often go through the same movements in imitation.

At one point I placed my camera focused on the trail, attached a fish line to the shutter lever, and then went behind a tree. Along came a bear, looked at me to see if I were animal, vegetable, or mineral, and then made for the machine. My only thought was of the soon-to-be-demolished camera, but instead of attacking it he simply sniffed at it and went his way. On his retreat I caught his photograph, as he stopped a moment and peered in my direction.

Old Bruin's furry coat is beautiful, sleek as a seal, and the head and neck covering is silvery. Ungainly in his leisurely way of walking, he yet covers much ground, and his run is a kind of falling lope. A grizzly loves a dark canyon near good feed and a stream where he can wallow in the mud for fly protection. He satisfies his appetite with berries, roots, and fish. He is full of curiosity, in temper defensive, and will not fight unless he feels himself cornered.

There have been no fatalities from the attacks of vicious or hungry bears in the Park. Following their evening custom, the members of a certain tourist party sat about their camp fire and told yarns. The cook had prepared the lunches for the morrow and placed them for safekeeping in a tub in the wagon. When at bedtime the cookie looked into the wagon, he found signs of a bear visit and of the lunch there was left but a few scraps of paper. This rude act on the part of Bruin caused a frightened minister to sit up all night armed with sundry weapons from the cook's tableware and harboring a strong distaste for bear meat.

The deer are frequently seen quietly eating or resting in the shade near the roads. They are stately creatures, and their body movements in running are the very embodiment of grace itself. There are about twenty-five thousand elk in the Park, so many, in fact, that the problem of feeding them in winter is a hard task, and a systematic organization supplies what feed can be secured from ranches in the regions beyond the Park. The Government is yearly moving portions of this vast elk herd to other parks. Elk are timid, gregarious, and travel in big herds. They keep some distance from

the roads, as they prefer seclusion. The best place to find them is in Hayden Valley near Mount Washburn, or around Shoshone Lake. A ride up Alum Creek from the Grand Canyon or Yellowstone Lake to the base of Mary's Mountain will surely reward one with some excellent photos.

The buffalo, about two thousand in number, are in Lamar Valley, where they are well cared for in the best possible place for breeding. From time to time the herd has been increased by outside purchase.

In the meadows of Hayden and Pelican Valleys and in the Gardiner alfalfa fields are many antelope. Mountain sheep may be seen in the more secluded places, but in the late spring they and the antelope disappear for the summer to the unknown districts. Of the deer, there are about one hundred white tails and one thousand black tails making their headquarters near Mount Evarts. Moose keep to the northeast corner of the park and in the Gallatin Basin. The smaller animals, such as squirrels, marmots, rabbits, badgers, and foxes, are numerous. Near Obsidian Cliff are beaver dams and houses. Many colonies are near Tower Falls, and here you can see them in the morning and evening working in the water or cutting down trees for food.

Uncle Sam has endeavored to rid the Park of undesirable tenants, so the taboo has been out against mountain lions and coyotes, the latter being particularly destructive to antelope, and no opportunity is lost by the officials to poison, trap, or shoot them. That the birds may not be molested, no cats or dogs are allowed in the Park confines.

The birds are numerous, but have so large an area in which they are protected that one rarely sees them. Also, the average tourist is "all eyes" for the geysers, hot springs, and natural wonders. One whole island in Lake Yellowstone is used as a nursery for the gulls and pelicans. Eagles are to be seen at close range, and by the aid of binoculars their nests and young, located on some high crag, may be studied.

The gamiest fishing is at the lake outlet and twenty-five is the limit. You are sure to catch some and photograph them, to back up your stories when you return home. It is a queer sensation to draw gamy, healthy fish from the warm waters of some of the streams; in some places, however, the fish are unfit for eating owing to disease, and these must be found and thrown away.

The animals of the Park, unafraid of man as they are, have shown themselves approachable to the "witchery of Kodakery," if the tourist uses common sense and does not press them too hard. Many schemes are used by the cameraist to photograph wild life in natural habitat and activities. Some have wire or bait so arranged that the animal himself sets off the shutter and flash. True, most wild animals are nocturnal in their habits, but plenty of good shots can be secured during daylight, if one but diligently watches a chance and has the apparatus ready. The best position is leeward to a trail.

A word as to the tenchnique of photography in this region. In average light and backgrounds we found that with a stop at one-sixteenth, time at one-twenty-fifth, and a universal focus of one hundred feet, we were

ready for quick work when the animal suddenly came into view, far or near. The tameness of many animals will allow one to "jockey" into position and so to place himself in more advantageous relation to his subject. An ideal size photo is 2¼x3½ inches, which makes a fair contact print and good enlargements, if good detail is present.

Overexposure is the common fault on the whitish formations, and, considering the purity of the atmosphere, a quick exposure must be made, otherwise a flat negative will result. Underexposure—the common fault in landscapes—results in harsh high lights and shadows. Too small a stop should seldom be used, as it gives such fine detail that the effect of the picture, as a whole, is in a great degree lost.

CHAPTER XIX

Photographic Developing in Camp

CAMERAS are now made so small and light that they are no encumbrance even on the hardest kind of a trip. Photographs of the wild animals, water sports, cosy camps, with perhaps an occasional print revealing the strenuous, the poetic, or the tragic life of the open, enable one on the long winter nights to live over the summer's trip in pleasant reminiscence. Somehow, the narratives and anecdotes one brings out of the woods lack that local color and freshness which pictures reveal.

Provide for a large number of exposures. Films are best because of their portability and daylight loading properties. They should be kept with great care from dampness and preferably packed in sealed tins, as prepared for tropical use and procurable upon special order. Remember that, as soon as they are exposed, films are subject to ruination, and should for this reason be developed as soon as possible. It does no good to seal them up again in the can after exposure, for one simply seals in dampness perhaps long enough to ruin them.

Except on back-pack trips, I have always taken along a developing outfit and an inelaborate one, too. All the items one needs are tubes or tablets of developer and hypo, both of these being packed in bottles and thus kept pure and dry, retaining their activity under

the most trying conditions of climate or storage. The dark room can be improvised in cellars, closets, and at nighttime in most any room. Even tents can be darkened by covering with blankets, tarps, and what not, so as to exclude light and permit safe handling of the sensitive film. Trays can be readily improvised by the same ingenuity which is displayed by the expert bivouacker. In a pinch I have used for trays the pasteboard lids from packing boxes, but these must be made waterproof by warming and covering the insides with melted paraffin. Tin kettles from the cook tent can be used as wash vessels. If the camp outfit contains granite ware, these can be employed instead.

One whole season with the U. S. Geological Survey in the field, I developed by the old-reliable lamp method in a tent, over which were thrown blankets on moonlit nights. All went as well as could be expected under such circumstances of inconvenience, until events took an unexpected turn and my dark room met its Waterloo. On the "Loo" Ranch I spied a cave and doted upon the luxury of a real dark room. Consequently, I arrayed my simple but efficient developing outfit about my elbows, and conforming my body to the irregularities of wall and ceiling in the damp atmosphere, began the sweat-box method in a combined tropical-Turkish-bath environment. My prize roll of wild animal views was coming out nicely, when some moving object above me loosened an avalanche of loose dirt. I hurried my pictures to the hypo and opened my lamp to recognize full appreciation of the doubtless friendly though odoriferous greetings of a member of the weasel family. Posthaste I secured from the nearest supply dépôt a

tank developer, and from it have had no incentive to institute divorce proceedings.

The tank developer really solves all difficulties of picture finishing in camp. It consists of a changing-box, where the film is rolled onto a spool with a deep-red, celluloid, light-proof apron so as to exclude the light. It is then safely transferred to a metal can with a tight-fitting lid, where the developer is poured on and left for twenty minutes. After rinsing three times in clear water, it can be safely unwound from the spool in subdued light and put directly into the hypo, where it is left the usual length of time. In using the film pack, one must transfer the film to the tank in a dark room. The rest of the process is conducted under the ordinary light conditions.

Makeshifts for lamps may tax one's ingenuity, but there is hardly a problem that cannot be solved if one goes about it in the right way. Small Stonebridge folding candle-lanterns can be covered with red cloth or paper and made to serve as admirable dark room lamps. Holes may be cut in any box and covered with red paper or cloth, and other holes cut for ventilation and a candle burned within. Proper cloth and paper should be used, because the actinic effects of the various dyes differ.

On a boating trip one may rig up a very efficient washing apparatus by putting one pail or kettle within another, making nail holes in the bottom of each. The films are put in the smaller inner pail, and a cover large enough to fit over the larger pail is fastened on snugly. A line lashes the contrivance to the rear of the boat and trails it. The object is to allow the water to reach the

films, but not with such force that it flattens them against the sides. This is done by the water rushing in through the bottom holes and gently circulating about the constantly moving film. If film is allowed to trail unprotected in the water, there is too much danger of damage from rough handling and from contact with débris.

In drying the film, one should protect it from the heat and from contact with any object which might scratch it. A convenient way is to pin the ends to crotches of trees, where they will be in the shade and in a draft. To prevent checking of the film, one should use an acid hypo and then wash in cold water. Checking is supposed to be due to heat. Water may be cooled by the evaporation bag, or one can dip the film in spring or cold river water a few times, and then dry it. Of course, it will not be well washed, but it will keep for a while and can be later more thoroughly washed at home. Under tropical conditions cooling of the solutions is not practical, and the films must be put through a hardening solution before development to protect the delicate film emulsion. When properly done, film can be developed in a temperature up to 80 degrees. Immerse the film or plate for five minutes in a bath consisting of formalin, five drops, and water, ten ounces, or for fifteen minutes in a solution of alum, one-half ounce, and water, ten ounces. After the hardening bath, wash the film well and put through the regular developing and fixing baths.

Water should be pure for photographic use. If much débris is present, it is well to filter it. A simple arrangement is to hold a piece of absorbent cotton in the

cleansed hand and pour the water over it. Thus will it run through into a clean receiving receptacle below, minus the dirt which is retained in the cotton.

Many so-called "moonlight" effects are made in the daytime with the aid of a ray filter and overexposure. The filter will bring into gorgeous relief clouds which to the ordinary eye were all but invisible. It does more than this—renders color values in proper light value in the finished negative. Special film emulsions, called isochromatic or orthochromatic, correct to some degree the film's incapacity to record color values. Some rays, such as yellow, are slowly recorded by the ordinary film emulsion; while others, such as blue, are overactive. Now, if all the rays which come to the emulsion are forced through a yellow transparent substance, the blues are made less active and the yellows more active. This process is really a filtering of the light rays, hence the name "ray filter". It is really an aid to the emulsion, although it is placed as an adjunct to the lens. A ray filter or color-screen may be made from a piece of film which is left unexposed, is developed, run through the hypo, washed, and dried. It is then dipped into a light yellow dye, or portions of yellow gelatin may be placed between two pieces of cardboard, in which are cut holes to fit the size of the lens board.

A mosquito headnet can be made from cheesecloth and film as follows: Leave unexposed two sections of your film roll and develop and fix as usual. These two sections will come out of the final hypo as clear as transparent gelatin and can be sewed into a headnet to act as little windowpanes. The rest of the net should be made of cheesecloth. This is superior to

the commonly recommended bobbinet, for it keeps out the smallest fly or mosquito. Take a yard square of the cloth and in the middle cut a hole the size of the hat crown. Put a draw string around this, and it can thus be adjusted to any hat or head. Now, make a yoke of tape fitting over the shoulders and across the back and the chest. The yoke corners have draw strings which are tied under the arms. Sew the cheesecloth to the yoke, and the celluloid window to the edges of the opening cut for the window at the proper position before the eyes, and the headnet is ready for use.

Photo Troubles in Hot Weather

Most vacation trips are taken in the summer months, and many of them lead to places where a high temperature prevails and photographic work is attended with difficulty and many chances of failure. These conditions present themselves in hot weather in the United States, as well as in desert regions everywhere, and in the tropics. The immediate development of travel pictures, although not always imperative if they can be sent home or have reasonably prompt attention, is nevertheless advisable, for too many photographs have been ruined by the camera not working. I know of one tourist who made a trip to Japan and who found, on developing all his exposures on his return, that he had not one good negative because his shutter had not operated—a mistake which developing en route would have obviated. In damp and tropical regions, as a general rule, films do not keep well, and

they should be developed as soon as possible after exposure.

The main obstacle in hot climate photographic finishing is that it is difficult to get and keep solutions cool enough to prevent melting of the emulsion, which occurs on films at 80 degrees, and on plates at 90 degrees. As a result of much effort to procure good negatives under torrid conditions, it has been found that first-class results may be obtained, even if the temperature of the solutions cannot be kept much below 80 degrees F. The process is comparatively simple, it entails but little equipment in chemicals, and is indispensable for hot climate photography.

For a prolonged journey, films should be specially secured from the manufacturers, sealed in their special tropical tin canisters. In a mountaineering trip in Glacier Park I had all my films so protected, and had abundant cause to be thankful, for while the packs were often thoroughly wet, the films were intact and good pictures were secured. When so encased, films retain recording value for a long time, but when taken out, exposed, returned to the can and sealed with adhesive tape (which should be found with every outfit), they do not keep well and hence should be developed as soon as possible.

The principle underlying the process of development at a high temperature is to harden the films, for we cannot consider the cooling of the solution, this being as a rule impracticable under tropical conditions. With proper hardening, films can be developed in a temperature up to 80 degrees F. (All photo manuals

advise keeping the baths down to 65 degrees F., under ordinary conditions, and plates up to 90 degrees F.)

The hardener may be used either before development or between the development and fixing bath, and either method must be carried on in the dark room unless a tank method is employed.

Hardening Before Development.—Choose any one of the following: A. Immerse for five minutes in a bath consisting of formalin, five drops, and water, ten ounces. B. Immerse for fifteen minutes in a solution of chrome alum, one ounce, and water, twenty ounces. C. Immerse for fifteen minutes in alum, one-half ounce, and water, ten ounces. After any one of these hardening baths, wash the negatives well, and then put through the regular developing and fixing processes.

Hardening Between Developing and Fixing.—To prevent softening of the film in developing, the temperature is lowered by setting the container in a dissolving hypo solution which has a refrigerant action. Temperature can thus be reduced 10 degrees F. A thermometer is used to control. The method advised is to use film tanks as follows: Three tank cups are needed—two of the regular size of your film, and one the next size larger. In the large tank, put one pound of hypo; set a smaller tank cup on top of this, filled to its embossed ring with developer solution whose temperature is not higher than 90 degrees F. Now pour water in between the two cups on the hypo and accelerate its solution by stirring. A noticeable cooling of the solution results, which cools the water in the inside tank. Be careful not to get hypo into the inner tank.

Development for the customary twenty minutes is

TROPHIES OF THE HUNT

It would be a shame to lose this fine skin. Every hunter should know how to treat these trophies so that they can be made up later into beautiful rugs to adorn the den at home. (*Above*).

The indispensable parka. (*Below*).

not desirable with this method, for the solutions would then have time to get warm again, so use a double-strength developer for five minutes. The smaller tank is then removed from the hypo solution, and the film, previously removed to the light celluloid apron in the dark box, is placed in the solution and repeatedly inverted during development.

The hardener is prepared during the development of the film in one of the small tanks. At once, after the removal of the small tank from the large hypo tank, take the other small tank and put in the hypo cooling solution. Fill it with water to the embossed ring and put in one-half ounce powdered alum (chrome) and one-half ounce sodium bisulphite and stir the hypo again; this will cool the bisulphite and alum solution down below 84 degree F. Remove this tank and fill the large tank with water up to sixteen ounces. The hardener is used after development. Remove the spool quickly, drain off the developer, and place it at once in the cup of bisulphite and alum solution, agitating it for a minute, and then take it out and without draining place it in the hypo fixer. The film, so treated, can then be safely washed in water as hot as 100 degrees F., if that be imperative.

Eradicating the hypo used for fixing commonly means prolonged washing in water, but in some places sufficient water is not available, and in hot-climate negative-making we should limit the amount of hot water reaching the film; hence, chemical neutralization of the hypo is used, and by it you can have the negative ready for drying three minutes after fixing. Make up freshly a gallon of very weak solution of potassium permanganate

by adding crystals to the water to produce a light pink color. A stronger solution acts as a reducer. The permanganate can also be secured in tiny tabloids, one of which is sufficient for a gallon of water. To use, place some of the solution in a shallow tray and wash the negative in it. As soon as the pink color is gone, pour out and use a fresh solution, repeating until the pink color remains unchanged.

Quick drying of the negative is desirable when your finishing is done under difficulties of great humidity or in a very dusty atmosphere. As is well known, ordinary alcohol extracts water, but denatured spirit should not be used, as it contains mineral naphtha, which leaves a white scum on the negative after drying. Place the negative in a strong grain alcohol solution and then remove it and stand it up to dry. Another method is to leave the negative for ten minutes in formalin, one teaspoonful to one ounce of water, then remove it to nearly boiling water, changed five or six times, and then dry before a fire.

The above methods are a distinct departure from the common dark-room way, but they will be found helpful to those who record experiences pictorially under extreme conditions.

CHAPTER XX

Leather Working for the Outdoor Man

Tanning and Curing Methods.—Leather is an interesting bit of handicraft, and one can make many useful articles for himself from the product he has prepared as well as attain skill in repair work which is a helpful vocation in any home.

In most cases we must rule out the procuring of hides as the profits of hunting or trapping, but at most any meat market one can get at a nominal price cowhides from beeves which are to be used as our food supply. Occasionally also one may get from other sources the skins of some of the smaller animals which he can tan with the fur on.

In curing a fresh, or as it is called a "green," hide, we must either dry it perfectly by stretching and tacking on to the side wall of a barn or shed out in the drying air, or by rubbing common salt into it well so as to take up all the moisture, for otherwise the hide would decay. Curing is mainly employed to temporarily preserve the skins until it is convenient to tan them.

In transforming green animal hides into leather, certain chemicals are employed to combine with the fibers of the skin in such a way as to keep them from decaying or to make them soft, pliable, and of good durability. As the hide comes from the butcher one side is covered with hair and the other side with some fat and shreds of muscle. To prepare it for the tanning

solution, the hair must be removed and the flesh side scraped well to remove every bit of flesh down to the skin itself.

A cured hide must be soaked in warm water for twenty-four hours, or until it is just as soft as a green hide. First, it is "fleshed" by stretching it upon a wall and peeling off the flesh parts with a knife, care being taken not to cut through the hide at any place. Then if the hair is to be removed, the skin, with the hair side up, is thrown over a smooth peeled log or rounded board and one end is tacked down. Seating yourself at one end, you take a flat piece of metal with a square, such as a flat file with one square edge filed smooth, and pressing it down hard on hair and hide and pushing it from you, peel off the hair and thin skin covering in which the hair grows. This removes the surface of hair, the outer skin with its little grains, and hence this step in the preparation of the hide for tanning is called "graining." The fleshed and grained hide is now ready for the tanning solution. A tight, wooden candy bucket or an old barrel is the best receptacle for the solutions.

Numerous successful tanning receipts are in use, some very simple and others requiring a number of chemicals to be put up by the druggist. We will consider only the simpler ones, with the mention of one more complicated, because of its excellence.

Oil Tan Leather Solution.—Shave a bar of common yellow laundry soap into a pail of hot water and dissolve. Now put in the fleshed and grained hide and keep it there until you can squeeze water through it, which simple test shows that tanning is complete. Then remove it and wring it out as dry as you can and

hang in the sun to dry. It can then be oiled with neatsfoot oil or old butter. Allow it to hang out for two days more, and then with a brush and warm soapsuds wash out all the oil that you can. Wring out and hang up to dry. Now it is pulled and rubbed while drying to break up the fibers, for if this is not done it will dry hard. The rubbing is hard work, but you should be persistent, and you will be able to get the article as soft as a chamois skin.

This method produces a leather similar to the Indian tanned buckskin. If you do not like the oil in the leather, you can smoke it, thus: Build a small wigwam out of bark, hang the skin up in it after the first drying, and build a smudge or smoke of hardwood, being careful not to get too much heat.

Chrome Tan Method.—This furnishes the lightest, most durable, and waterproof leather or fur tan that we have, and it is a leather suitable to most all purposes, such as the making of moccasins, mittens, shoe laces, etc. Since the formula calls for a rather difficult list of chemicals it is advisable to have your druggist put up a sufficient amount so it can be diluted, as follows:

Chrome alum crystals, 2½ pounds.
Sodium carbonate crystals, ½ pound.
Copperas crystals, ¼ ounce.
Common salt, ½ pound.

When you get this home, mix it in a wooden bucket with one gallon of water. Now, when you wish to tan a hide, take one part of the above stock solution and twenty parts of water and immerse the green hide in it for half a day. Then wring out, and while it is drying, work between the hands so it won't dry hard.

In tanning furs, we must flesh the hide as above directed, but omit the graining process which would remove the hair. Furs for rugs or rabbit skin robes are prepared in this way.

Fur Tan Paste.—Take of common salt, one-fourth pound; alum, powdered, one-fourth pound; borax, one ounce.

Add just enough hot water to melt the above, and then when cool add enough sawdust or corn meal to make a thick paste. Spread this thickly on the fleshed side of the hide. Fold the skins over to the middle where they meet, then roll from the head end toward the tail end into a compact roll. Put in a cool place for a week, now and then unrolling and sprinkling to keep it wet. Then scrape off the tan paste. If it is a thick skin—reapply another coat of paste, roll up, and leave for another week. Now scrape off the paste, clean and rub between the hands while it is drying to make it soft. This method does not waterproof the leather, so keep it in a dry place.

Some Uses of Leather by the Camper.—The leather prepared according to the directions given above can be used to make camp equipment and in repair work of various kinds.

For sewing materials one needs a sharp knife, an awl, harness needles, harness or shoe thread, beeswax, and a clamp or vise. The best sewing awl is a lock-stitch awl. With this simple device you can do all kinds of sewing, and it takes the place of the awl and needle, and its special thread is the best general purpose sewing thread one can secure. It makes stitches like

the lock-stitch machines and is composed of an awl with needle eye through which the waxed thread is carried through the leather, a return loop is formed, another thread is carried through the loop, then both are drawn tight, and the next stitch spaced and done as above.

In strap mending harness traces, lines, shoe soles, etc., it is well to cut a "channel" with the knife point and enlarge the same by running a pointed stick along to open the shallow furrow. In this channel lies the stitching, and it is thus protected from wear after the channel is covered by smoothing down the lifted lip of the leather with the smooth awl handle.

The pieces of leather must be held in rigid position by a clamp or vise of some sort. Two boards may be nailed together and the leather put between, allowing a portion to protrude so that the stitching can be done freely.

In sewing a half-sole on a shoe, the oak tan leather piece must be soaked for a day to make it pliable so it will conform to the shape of the soles, then it is tacked on over the sole and trimmed with a very sharp knife to the proper shape around the welt. A shallow channel is next made about one-eighth of an inch in from the edge and the lock-stitch employed. The lap of the channel is next smoothed down, the end next the heel nailed down, and the job is done. Heels are nailed on piece by piece, trimmed nicely with a sharp knife, smoothed with sandpaper, and then blackened.

To avoid mistakes, it is safest to draw a pattern out of heavy paper of the article you want to make, then

cut it out and use it to plan the leather before it is cut.

How to Make Your Own Mittens.—Since the sizes of the hands differ so much in different individuals, one should place the hands, fingers together, on a piece of paper, and then draw an outline of the hand and allow one-half to three-quarters of an inch extra all around. Fig. 2. Then round out with a pencil the ends so that they are symmetrical, and then square the wrist ends with the exception of the thumb portion, A, D, B, F. Allow a flap one-fifth the length of one palm which will extend as the back of the thumb and be in width not quite a half of the distance across the end, A, F. Now fold at the line C-C, and sew the edge E-E together. The thumb back is a separate piece, Fig. 3, and is half as wide as the palm piece and three-fourths as long. The corners G-G and H-B are sewed, so that D-D approximate. The flap D, of course, folds downward and is the inside of the thumb. For the left hand, fold the thumb flap the other way, just large enough so that in cold weather you can first put on a pair of woollen mittens or worsted gloves and then draw the leather mittens over. This serves as a wind and cold break and takes the hard wear. It is the best hand-warming combination there is.

Axe Sheath.—The hiker's axe should be the light weight hunter's style with a fairly long handle. An expert woodsman prides himself on the keen edge he keeps on the axe, and in use he carefully protects it from contact with stones and from rust. Unprotected, it may cause disaster by cutting its owner or valuable portions of the pack, hence it is well to carry it in a

special sheath or scabbard which has a belt loop. It should be made roomy enough so that the axe will not be too hard to remove for use.

Measure your axe outline on rough paper, marking the position of the handle also. Place this on a piece of leather and cut. Allow a half-inch extra all round and provide extra for the flap, Fig. 4, on which a short strap is sewed to be later fastened to the buckle on the front—as H. In the middle of the back, two parallel cuts, I-K, are made in length to correspond to the width of your belt, and in width about a half-inch. By pulling this loop away slightly, there is sufficient room for the belt to slip through. Sew the edges A-E to A-D, and B-F to B-G together, leaving the top unstitched, folds being at E-F and A-B. This opening is left for the handle of the axe to slip through and extend below A-C.

A sling strap with adjusting buckle may be attached to the blade and helve ends of the sheath at E and F, should one not care to carry the axe in the belt.

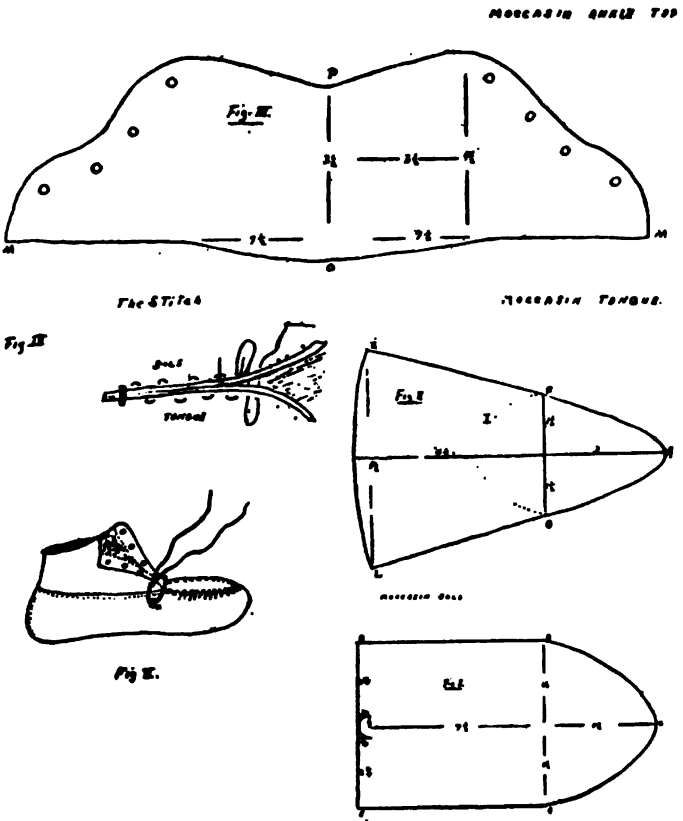
Sheath for Knife, Fork, and Spoon.—In making a sheath for knife, fork, and spoon, roll them together in a compact bundle, then with rough paper measure out the proper size of the sheath. Fig. 5. Make it plenty long so as to nearly cover the knife handle and the articles will not easily slip out. Before sewing, attach a belt loop at A and turn over the back and attach one end at B; fold along the line C-C and stitch around the edge leaving C-D open. It is now ready for use.

Moccasins.—The ideal foot covering for woods wear is the moccasin, it being light in weight, soft on the feet, warm, and noiseless. If on a hike, heavy-soled

shoes are preferred; one appreciates the comfort of the soft moccasins on the feet when in camp. They weigh so little and are so easy on the feet that one pair should be in each individual equipment.

Moccasins are easily made if one works methodically. Because sizes here play an important part, you should make the pattern first from heavy paper or cloth. Put your feet down on the paper and draw the outline. This gives you the length and width. Make it plenty large enough, for the leather shrinks upon drying and a little extra room is needed to make up for this. Allow about an inch surplus all around the foot, then trim the edge to the pattern as shown for the sole. Fig. 6. The patterning of the toe should be carefully done and exactly alike on both sides. The vamp, which rests on the top of the foot, should be wide enough to draw the side neatly into shape and plenty long enough to serve as a tongue also. It is easier to make the vamp quite large and thus throw the seam lower on the toe and sides, then sew the vamp into place. Now cut the pattern from the leather which has been well soaked in water.

First fold A-B and C-D along the line E-F, then sew A-H to B-G and E-H to E-G. This finishes the heel. From A to C is one-half inch longer than the foot, and when A-B are brought up to the sides of the foot the edge is one-half inch below the ankles. Sew up C-D folded at F; stitch in a puckering string from I and to K and draw up tight at I-K. The vamps should fit this opening, the tip L fitting in at F. Sew the vamp sides L-M to the sole piece F-I and L-N to F-K. The ankle piece is to fit K to K and I to I and



MOCCASIN MAKING.